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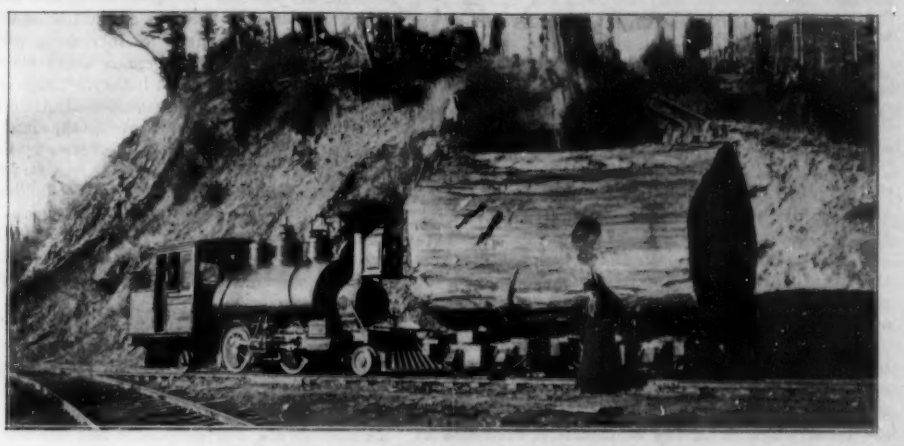
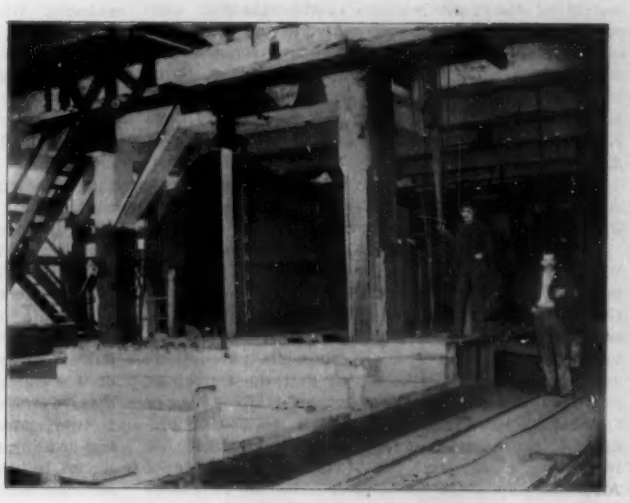
A Redwood Tree 350 Feet High, 30 Feet in Diameter, Produced 80,000 Feet of Lumber

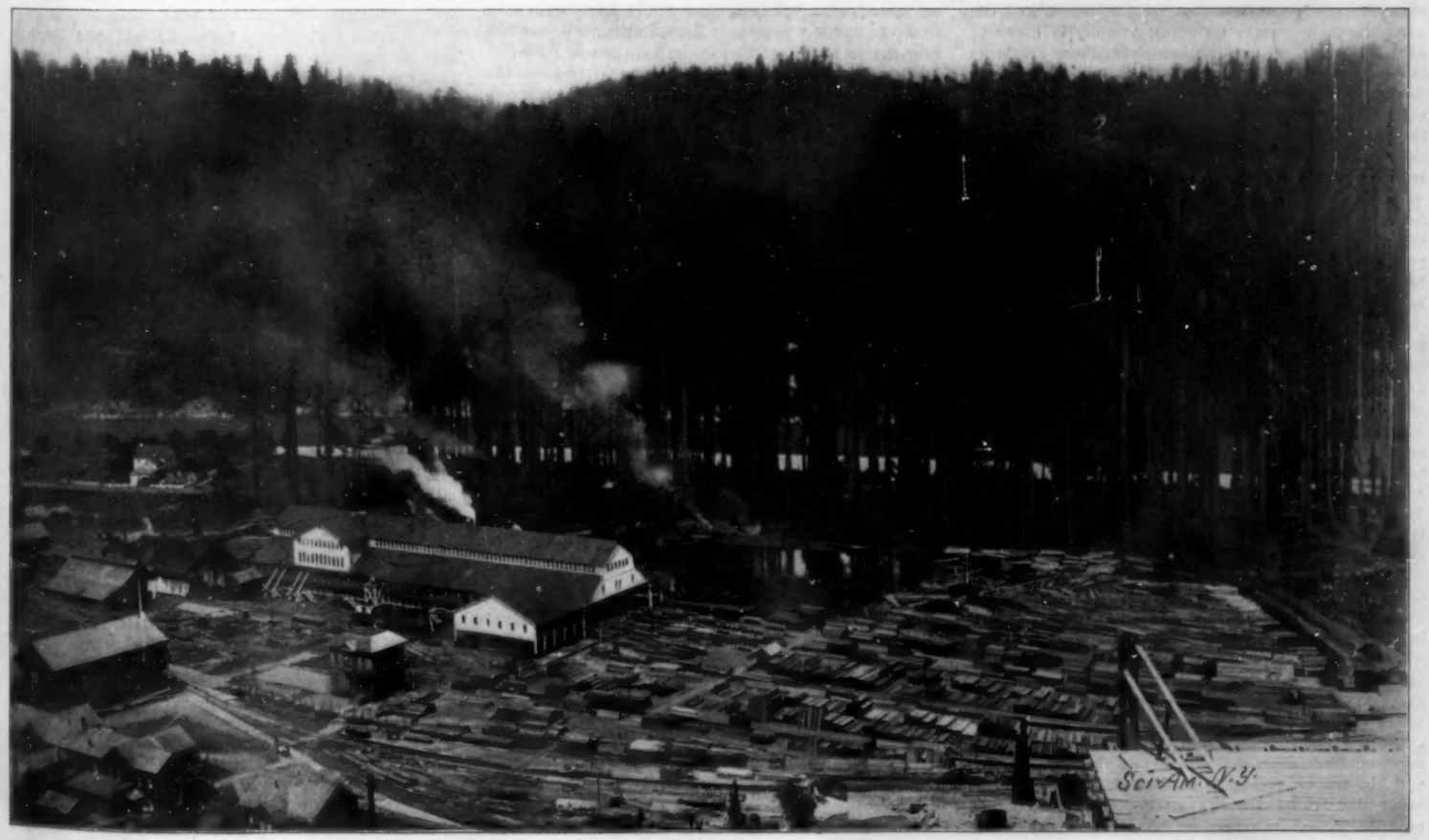


A Twelve-Foot Log, 10,800 Feet Board Measure in the Log.

Millpond Showing 3,500,000 Feet of Lumber for Window Work.



A Fourteen-Inch Bandsaw at Work.



GENERAL VIEW OF A TYPICAL CALIFORNIA LUMBER CAMP.—[See page 70.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, AUGUST 2, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

COMMERCIAL ALASKA.

A million dollars a month is the estimate made by the Bureau of Statistics of the present value of the market which "frozen Alaska" offers the producers and manufacturers of the United States.

By reason of the application of modern systems of travel and transportation, Alaska is now as accessible as Arizona. Three days of travel by modern ocean steamers from Seattle, among the islands and along the coast which form the southeastern extension of Alaska, lands the traveler at Skagway; twelve hours by rail over the mountains carries him to the headwaters of the Yukon, where comfortable and well-equipped river steamers carry him to the gold fields of central Alaska or down the Yukon River, which is navigable for more than 2,000 miles at this season of the year. From the mouth of the Yukon another comparatively short trip by steamer carries him to Cape Nome—the latest and greatest of the gold fields of Alaska.

Gold, fish and furs are the principal industries of Alaska at the present time; and their value to the United States is $15,000,000 annually.

The cost of Alaska was $7,200,000. The revenue which the government has derived from it since its purchase amounts to over $9,000,000, and the value of the products is now twice as much every year as it cost. The total value of the products of Alaska brought to the United States since its purchase is (according to the best estimates that the Bureau of Statistics is able to make) about $150,000,000, of which $50,000,000 is precious metals, $50,000,000 products of the fisheries, chiefly salmon, and $50,000,000 more furs, chiefly seal fur. Probably $50,000,000 of American capital is invested in Alaskan industries and business enterprises, including transportation systems. In the salmon fisheries alone, the companies engaged have a capitalization of $22,000,000 and the value of their plants, including vessels, is given at $12,000,000. In the mining industries there are large investments, the great quartz mill at Juneau being the largest quartz stamp mill in the world, while several other quartz mills represent large investments. With the inflow of capital, the development of transportation systems, and the gold discoveries, have come the building of towns and the development of cities with modern conveniences of life. Nome City, which is located but a comparatively short distance south of the Arctic circle, has now a population of over 12,000; postal facilities have been so extended that the number of postoffices is now about sixty, and mails are being regularly delivered north of the Arctic circle.

Agricultural opportunities in Alaska have, until within a recent period, been considered of but slight importance. As the country was explored, however, and its conditions of climate and soil studied, its natural products observed, and experiments made with various classes of agricultural productions, it became apparent that the agricultural possibilities of the country, and especially of the south and southeast, where the climate is modified by the Japan current, were of considerable importance, in view of the practicability of furnishing at least a part of the food supply of the population which the varied resources of Alaska seem likely to sustain and make permanent. Grasses for the support of cattle are abundant, and the experiments with live stock thus far justify the belief that this feature of the food requirements of Alaska may be furnished by the development of stock farms in the southern sections. In the north vast areas are covered with a moss similar to that upon which the reindeer thrives in other parts of the Arctic regions; and in view of this fact, the introduction of reindeer from Siberia was begun a few years since, and has proved extremely successful, about 3000 now being distributed through northwest Alaska. The experiment has advanced sufficiently to justify the confident belief that the reindeer will within a few years prove an important feature in furnishing both the transportation and food supply of northern and northwestern Alaska.

The gross area of Alaska is, according to the 1900 census, 590,804 square miles. The Governor of Alaska in a recent report states that this is equal to the combined area of the twenty States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee.

THE SCARCITY OF HORSES.

With all our American ingenuity and enterprise in manufacturing electric cars and automobiles to relieve the horse of the drudgery of increasing work and the cruelty of drivers, the horse is being advanced to a higher plane of utility and luxury. There is no longer a demand for the cheaper grades of street-car horses. The African war took several thousand, but the armies of the world call for the better class of horses. The old cab horse, that stands in the streets day and night, is being supplanted by automobiles in cities where good pavements prevail, just as the horse was relieved from the street cars by electricity; thus, step by step, the horse is being advanced, and we welcome every improvement in mechanical power as a blessing to the horse.

The growth of our cities and industrial centers increases the demand for horses of a better class. The big draft teams in our city streets indicate the prosperity in this country; and it is the ambition of our manufacturers to get the finest draft horses to be had. While our merchants and express companies are increasing the number of handsome active horses, the grocers and tradesmen utilize many of the cheaper animals. While a few wealthy people own an automobile they must have fine horses, and with the cheap price of vehicles in America, with so many big factories, almost everybody has a horse and buggy, surrey, or carriage, while all who can afford it have handsome coach and carriage horses—the prices of which are higher than ever before known. The demand for all the better classes of horses is far greater than the supply, because our farmers became discouraged six or eight years ago, and quit breeding, when panic prices were below cost of production, and the fear that the bicycle and electricity would soon displace the horse.

With the return of prosperity came the increased demand for horses, but a higher class and at higher prices. We now have an era of industrial horses and horses of luxury, never before known in the history of this country. After our civil war in 1865, we discovered we were horse poor, with millions of little trotters, mules and ranch ponies. We began importing draft horses, and later the large handsome coach horses, to increase the size and utility of our American horses. We imported these animals by the thousand from Europe to improve our own, more liberally than any nation has ever imported any pure breeds of stock, and when prices dropped the export buyers took 50,000 to 75,000 a year to Europe, until our prices last year got so high that they could handle but a few.

With the revival of commercial prosperity came the increased demand for good horses; and with no breeding for a few years, the horse buyers soon culled out the good horses, and we are now in the midst of a horse famine.

Farmers rallied to horse breeding as prices advanced, and our importers are again annually importing shiploads of pure-bred stallions of the Percheron or French draft breed, known in the cities as the Normans; from France some of our importers brought 200 last year, and brought still more this year. The importations of Belgians, English Shires and Scotch Clydesdales are all increasing for our draft horse production, while our importations of French coach, German coach and hackney horses is annually growing.

Eight to ten years ago, these stallions would not sell for more than $200 to $500; now they readily sell at $2,000 to $5,000—ten times as much. They are chiefly bought by companies organized to improve horse breeding in different localities of the horse-breeding States: Ohio, Indiana, Illinois, Iowa, Kansas, Nebraska, Minnesota, Wisconsin, Michigan and Missouri. The little American trotter, while the fastest horse in the world, bred for speed, but lacking the size and beauty of carriage and coach horses, is relegated to the sporting racetrack, much as the thoroughbred is fit only for racing. The draft horse is now the most profitable and most popular horse with the American farmer, who requires a good draft team for his farm work. The little trotters are increased in size and utility by crossing with the large handsome coach horses.

The whole world wants more good horses. England, France and Germany cannot supply their cities and their armies. Russia, with 25,000,000 horses, has no good horses for export. America is the only country from which large supplies may be had, and when our increased horse production begins to mature, we can supply the world as well as our own increased market interests in all our growing cities. The export trade will always maintain good prices for our horses, and while many farmers may still raise scrubs, the enterprising American farmers get the best improved horses to be found in the horse-breeding countries of the old world. Now they breed to suit the market demand for high-class horses to supply the markets of the world.

SOME OLD SHIPS.

Investigations recently made show beyond a doubt that the oldest warship extant is the "Victory," Admiral Nelson's flagship at the battle of Trafalgar. The "Victory" was launched in 1765, and is now 137 years old. She has passed many a year tied up to her dock at Portsmouth, and the tooth of time has left its destructive mark upon her. Not so long ago the British Admiralty spent a considerable sum of money in saving the old ship from ruin.

As a general rule, the lifetime of a ship built of the very best material scarcely exceeds 120 years. To be sure, there are exceptions. Perhaps the most remarkable of these is the case of the whaler "True Love," of Hull. The "True Love" was a bark of 248 tons, and was built in Philadelphia in 1748. After she had sailed for a few years under the American flag, she was purchased by an Englishman and converted into a whaler. When she was 97 years old, old enough to be retired, she still voyaged to the Arctic Ocean. After changing hands once again she was still in active commission for forty-four years as a carrier of wood in the Baltic Sea. Finally, after an active life of 139 years, she succumbed to the inevitable ax.

Still another hoary ship was the sailing vessel "Betsey Cains." The exact date of her launching is not known. But it is definitely recorded that in 1688 she bore the name "Princess Marie," and had the honor of carrying Prince William of Orange to England. She was then used for a time as a pleasure yacht by Queen Anne. After her period of royal usefulness had passed, she was sold and rechristened "Betsey Cains." Her end was pathetic. She was shipwrecked at Tynemouth in 1827, after she had carried the English flag uninterruptedly for 139 years.

A long life was also granted to the three-masted schooner "Three Sisters," a contemporary of the "Betsey Cains." She had taken part in 1689 in the siege of Londonderry. At the beginning of the last century, after she had attained the respectable age of 130, she was still voyaging in the Irish Sea.

In an account of old ships the brig "Brotherly Love," which carried Capt. Cook on many a notable voyage should not be omitted. After a service of 140 years she sank in a collision in the harbor of Hamburg.

In November, 1892, the Danish ship "De Tree Sostrene" cast anchor in the harbor of Dundee. Some curious person hit upon the idea of looking up the history of the vessel. The investigation proved that the Danish ship was built in 1772 in Rudkjöbing, and was at that time 120 years of age.

The "Success," which voyaged from one English port to another, was launched in 1789. As late as 1895 she made a voyage to Australia, and later crossed the Atlantic Ocean.

An investigation carried out some time ago by the shipping register officials of Great Britain showed that on their books were recorded twenty-four English ships over a hundred years old, and thirteen over ninety-five years old. A ship twenty-six years old was reckoned "middle age."

It is, of course, difficult to ascertain what is the maximum term of service of a steamship under the most favorable conditions. It is remarkable, however, that of the steamers built from 1815 to 1830, not a single one seems to be in existence. This is, perhaps, due not so much to a lack of endurance in the steamship as to the fact that the cost of running a modern vessel is less than that of an old-timer. The oldest vessel of the English merchant fleet is the sidewheeler "Sir Charles Ogles," of Halifax, built in Dartmouth in 1830. The oldest English iron steamer is the Cardiff ship "Swift," which is now 71 years old, and is still in active service.

A NEW FORM OF RADIATION.

In a paper read before the Académie des Sciences, M. Albert Nodon describes his researches upon actino-electric phenomena. He finds that when luminous or ultra-violet rays are projected on a thin conducting plate they give rise, on the non-lighted face, to radiations, which are analogous to X-rays or those of radium. The phenomena may be observed by a simple arrangement consisting of a small box of blackened zinc, having a movable slide on one side, on the other a door, and an opening in the bottom. The box is placed upon a gold-leaf electrometer with single leaf, inclosed in a Faraday wire cage. The box contains a brass sphere, insulated, which when charged forms a condenser with the walls of the box, and the variations of charge are observed by the gold-leaf of the electrometer. The metal box is light-tight and con-

nected to earth. The movable slide is formed of interchangeable plates of thin metal. If a luminous beam is now projected on the metal slide, it is found that the inner sphere becomes discharged. When a water-screen is inserted to cut off the heat, the effect is not changed. The discharge of the sphere is more rapid as the light is stronger and contains the smaller wave-lengths. An arc formed between graphite rods with aluminium cores gives a strong effect, on account of the ultra-violet rays. The discharge of the sphere ceases as soon as the passage of the light is interrupted by a screen of ebonite, etc. The effect may also be observed by reflection, and if a lead plate is placed near the box and the light reflected from its internal face, it discharges the sphere. It thus appears that a certain kind of radiation takes place within the box, coming from the inner surface of a metal plate which is lighted from the outside. This radiation will pass through a thin metal plate interposed in its path, and also through black cardboard, wood, glass and other bodies. It produces the discharge of electrified bodies, as in the case of the sphere, but does not seem to produce a fluorescence or to act upon a photographic plate, at least for short exposures. These rays differ from the cathode rays, since they traverse the metals and cardboard. They seem to have properties intermediate between the X-rays and radium rays.

THE HEAVENS IN AUGUST.

BY HENRY NORRIS RUSSELL, PH.D.

The change in the aspect of the heavens from month to month is not great, so that a description of their appearance at any time has of necessity much in common with that of the month before. We recognize this as we study the August skies. Vega, which a month ago was some way east of the zenith, is now almost exactly overhead, and Arcturus is more than half way down toward the western horizon. Hercules and Corona lie between these two stars, and Ophiuchus to the southward. Below is Scorpio, rapidly sinking to the horizon. Libra is west of it, with Virgo setting beyond. Draco is above the pole on the left, and Ursa Major below.

The Milky Way arches right across the sky. At its northeastern base Perseus is rising. Above it are Cassiopeia and Cepheus, and then Cygnus, nearly overhead. To the south we reach Aquila, and finally Sagittarius, at the other foot of the arch.

Andromeda and Pegasus are near the Galaxy in the northeast, and Capricornus and Aquarius occupy the dull southeastern sky.

Saturn is about an hour east of the meridian, and may be recognized by his brightness—he is of the first magnitude—and his yellow color. Jupiter is about an hour farther east. As he is ten times as bright as anything else in the sky, there can be no mistaking him.

Before it passes out of sight let us take the opportunity to look at one of the very few stars of whose real dimensions we have any knowledge. This object—Delta Libræ—may be found as follows: Some 15 degrees west of the head of Scorpio are a pair of fairly conspicuous stars—Alpha and Beta Libræ. Delta Libræ lies to the left of Beta, which is the upper one of the two, at about one-third the distance of Alpha and about as far from the latter as Beta itself.

It is normally of the fifth magnitude, but at intervals of 2 days 7 hours and 51 minutes it drops below the sixth magnitude, and disappears to the unaided vision. As this period is very nearly one-third of seven days, the minima occur on the same days of the week for some time. At present the best observable ones occur late on Sunday evening near midnight. As the star begins to fade about six hours before the minimum, its loss of light should be easily detected before it sets.

There are about twenty other stars that behave like this one, showing a generally constant brightness, interrupted at regular intervals. They form a well-defined class of variable stars, known as the Algol variables, from their most conspicuous member.

In explanation of their behavior it was long ago suggested that they were attended by dark companions which eclipsed them at every revolution. In the case of some of the brightest of these stars the "eclipse theory" has been strikingly confirmed by the spectroscope.

Delta Libræ is the latest addition to this class. Photographs of its spectrum, taken last spring at the Yerkes Observatory, show that the star is receding from us before minimum and approaching us after it, just as it should do on the eclipse theory. The results so far published, though insufficient to determine the orbit with accuracy, show that the orbital velocity of the bright star is about 90 kilometers, or 55 miles, per second.

Multiplying this by the number of seconds in the period, we find that the orbit of the bright star about the center of gravity of the system is some 11,000,000 miles in circumference, so that the distance of the star's center from the center of gravity is about 1,750,000 miles. How far away the dark companion is on the other side we do not know; but we have this basis for conjecture. At minimum Delta Libræ loses about two-thirds of its light. The eclipsing body, therefore, obscures two-thirds of the area of the bright star. If the eclipse is annular the area of the dark star is two-thirds that of the bright one, its diameter consequently about four-fifths as great, and its volume a little over half as much. But if the eclipse is partial the dark star may be as large as the bright one or larger.

What kind of eclipse really occurs can be determined by exact observations of the star's brightness.

In the absence of data on the subject we will assume an annular eclipse. If the stars are of equal density the mass of the dark one will be about half that of the bright one. It must then be twice as far from the center of gravity, that is, 3,500,000 miles. The centers of the two stars would then be a little over 5,000,000 miles apart.

Since the eclipse lasts 12 hours, while the period of revolution of the stars is 56 hours, they must describe about 80 degrees of their orbit during eclipse. A simple geometrical construction shows that the sum of their radii must be about six-tenths of the distance of their centers, that is, in this case, some 3,000,000 miles.

Bearing in mind the ratio of the areas of the two stars, we find for the *diameter* of the bright star the value 3,300,000 miles, nearly four times that of the sun, and for the dark one 2,700,000 miles.

This result depends on the assumption we have made. If we had assumed the two bodies to be equal in size and mass we should have found their diameters to be about 2,200,000 miles.

In any case, it is evident that this inconspicuous star is really much larger than our sun.

THE PLANETS.

Mercury is in superior conjunction with the sun on the 10th, becoming an evening star, but is too near him to be seen this month.

Venus is morning star, rising about two hours before the sun.

Mars is morning star in Gemini. On the 1st he is close to Venus, but by the end of the month he rises an hour before her.

Jupiter is in Capricornus. He is in opposition on the 5th, and, with his satellites, is a splendid object in the smallest telescope.

Saturn is in Sagittarius, well observable in the early evening.

Uranus is in Ophiuchus, and is due south at 7:30 P. M. on the 15th.

Neptune is in Gemini, observable before sunrise.

THE MOON.

New moon occurs on the afternoon of the 3d, first quarter on the night of the 10th, full moon on that of the 18th, and last quarter on the morning of the 26th. The moon is nearest us on the 1st, farthest off on the 13th, and nearest again on the 29th. She passes Mercury on the 3d, Uranus on the 13th, Saturn on the 16th, Jupiter on the 17th, Neptune on the 28th, Mars on the 30th and Venus on the 31st.

SPONGE FISHING IN THE LEVANT.

Greek and Turkish sponges have been known to the trade for hundreds of years. Syria furnishes perhaps the finest quality, and shipments are made from Tripoli and Latakia to Paris, London, Trieste, Hamburg, New York and Piræus. During the last fifteen years, however, the output has greatly diminished, owing to the introduction by Greeks, in the seventies, of diving apparatus, which proved ruinous to fishermen and fisheries alike. It is estimated that the annual exportation of Syrian sponges at present hardly exceeds $85,000 in value. In the adjoining territorial waters of Cyprus, sponge beds are being worked with varying success. Sponges were exported from that island in 1898 to the amount of $10,425, and in 1899, $28,835 worth were shipped. Egypt, Barbary, Crete, Rhodes, Samos, Calymnos, and other islands of the Turkish and Greek archipelagoes also produce sponges for export. A large share of this trade was formerly in the hands of merchants with headquarters in Symrna and Trieste, but it is now centered in London and Piræus. The United States annually buys sponges abroad to the amount of about $500,000, the principal shipments proceeding from Nassau (Bahama Islands), London, and Piræus.

The highest grades of sponges—the softest and finest in texture—are found principally in the Mediterranean. Some of the cheaper varieties are also found there, but none like those taken in Florida or Cuban waters. All through the Mediterranean, except the western half of the northern shore, three species of sponges prevail at a depth of 2 to 100 fathoms, viz., *Euspongia officinalis*, *Hippospongia equina*, and *Euspongia zimocca*.

In collecting the sponges four methods are employed—harpooning, primitive diving, dredging, and diving with special outfit.

With harpoons one of the chief difficulties is to see the bottom clearly through a troubled sea. To obviate this a wooden or zinc plate cone, like a water bucket, open at the top and with a glass bottom, is used. On looking through this water glass, which is partly submerged, the bottom of the sea may be clearly studied even at thirty fathoms and the proper sponges picked out by the harpoonist.

The primitive method of diving, with no other apparatus than a slab of stone as a sinker and a cord to communicate with the surface, is most popular in the Levant. On reaching the bottom the diver hastily snatches up as many good sponges as possible, and, after remaining under water from one to two minutes, tugs violently at the cord and is drawn to the surface. The sponges are collected in a net which the diver carries around his neck.

At greater depths, particularly along the coasts of Asia Minor, dredging is employed usually in winter, when storms have torn up the seaweeds which cover the bottom.

To these simpler operations was added some twenty-five years ago the "skafander," or diving apparatus, which enables the diver in his submarine dress to spend an hour under water at a depth of from ten to fifteen fathoms. Experience has shown that the employment of the last two methods is a severe tax upon the sponge banks, as everything in sight—sponges large and small—is gathered. Germs and seeds also suffer greatly, and it takes years before a new crop matures. The fishermen who use the skafander are frequently stricken with palsy of the lower extremities, stricture, and other complaints.

The abuses which so disastrously affect the Levantine sponge industry have prompted a Russian philanthropist, Prof. Charles Flégel, to inaugurate a campaign for the abolition of diving apparatus in sponge fishing. Through his efforts the authorities of Samos, Crete, and Cyprus have prohibited the use of the skafander; also the governments of Italy and France, the latter acting in behalf of Tunis. The question is also being agitated in Egypt. It is said the matter will be taken up and discussed at the International Fisheries Congress, which is to be held in St. Petersburg in February and March. If the Turkish government joins the crusade the skafander will most likely have to go, and, in the absence of this "engine of destruction," a new era may dawn for sponge fishers and sponge fisheries in the Levant.

As far as known no steps of importance have been taken to protect the sponge beds in Turkish waters. A close season has been proposed, but has not been established by law. The government collects from each boat using the harpoon or the primitive diving system 319 piasters gold ($14.03) a year. A skafander boat pays $145.20 per season, and its operations are limited to eight months in the year, beginning April 1. From the drag-net boat a license fee of $22 is exacted.

At present only occasional shipments of Syrian sponges go direct to the United States. Considerable quantities, however, are bought in London and Piræus. Along the Syrian littoral the demand of merchants, especially for white sponges, exceeds the supply, and prices naturally have an upward tendency. This, in connection with West Indian competition, hinders trade with America. The introduction of antiseptic surgery has also decreased the urgent demand for the Turkish article. With the advent of regular, direct steamship facilities, however, it is likely that Syrian sponges will find a fairly responsive market in the United States. Importers are referred to Dr. Harris, United States consular agent, Tripoli, Syria.—G. Bie Ravndal, Consul at Bierut.

VAPORIZATION EXPERIMENTS.

The experiment of freezing water by its own evaporation is more often described than performed, as it succeeds only with an unusually good air pump. A similar experiment with melted camphor is less impressive in one way, for the temperature required to freeze the camphor is not very low, but the experiment is far more showy, can be exhibited to a greater number at once, and is very easy to perform. A very slight diminution of pressure brings the boiling point below the freezing point, so that if a flask or test tube of melted camphor be connected to an air pump, and but one or two strokes taken, the liquid will boil under the reduced pressure, and almost immediately flash into a bulky, porous, solid mass, puffed up by the vapor that was coming off during the act of solidification.

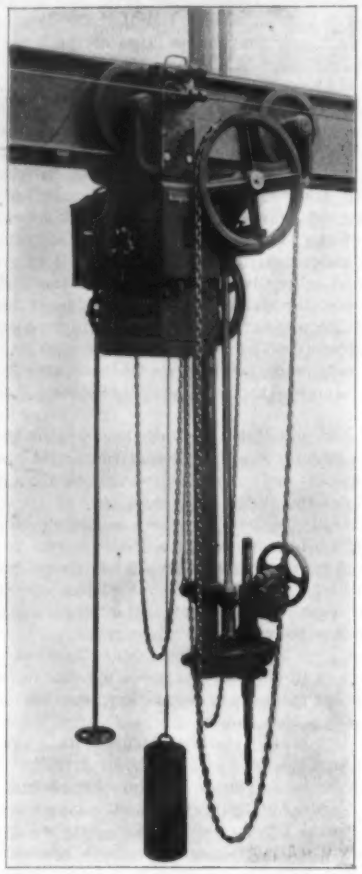
By heating the camphor under diminished and varying pressure it is easy to change at will from sublimation to distillation. If a cold rod is thrust down a test tube in which camphor is boiling, the cooler vapor in the upper part of the tube condenses on the rod in sparkling crystals, like frost, while lower down the hotter vapor is condensing to liquid. In fact, camphor may be made to illustrate, not only the appearance, but the true cause of formation of frost, snow, etc., while, in its pleasant odor, it has an advantage over many substances used in experiments of this kind.—W. P. White, University of Wisconsin.

SWISS TRAVELING CRANE TOOLS.

BY P C. PERKINS.

One of the most interesting and practical electrically-operated machines now in general use in the machine shops of the leading manufacturers in this country and abroad is the overhead traveling crane. It is now considered by most engineers that the overhead traveling crane operated by electric motors is a necessity for the rapid and safe handling of all heavy work, and for moving the tools themselves when portable. It is becoming more and more the practice to use separate electrically-operated portable tools, bringing them in succession to the heavy work requiring their use. In order that the electric cranes may operate in all the parts of the shop, reaching every tool, or every large piece of work to be tooled, there must be no overhead obstructions, and we find this another reason for the direct-connected electrically-driven tool, with its entire absence of overhead pulleys and shafting. The Maschinenfabrik Oerlikon, of Oerlikon near Zurich, have recently designed an attachment for electric cranes, whereby the tool electrically operated is directly mounted upon the crane, and may easily be brought to the work to be drilled at any part of the shop. The motor is controlled from below where the work is being done, and a suitable counterweight balances the drilling apparatus, allowing it to be easily moved up or down. A direct-current motor supplies the necessary power. The electric cranes are operated by either alternating or direct-current motors, although the latter are more extensively used at the present time, on account of the ease with which they may be controlled, and the great range of speed possible with the direct-current motor. The alternating-current motor has, however, the advantage of having no troublesome commutator, and may be made practically ironclad. Where the induction motor can be used, not even slip rings and brushes are necessary, which is a decided advantage; but in most cases slip rings and brushes are found quite necessary, in order to introduce resistance on starting, and hence alternating-current motors for this class of work are not as extensively used as direct-current motors.

A weighing device suspended from a crane would undoubtedly find extensive use, as any heavy piece of work could easily be raised and its weight noted without difficulty.

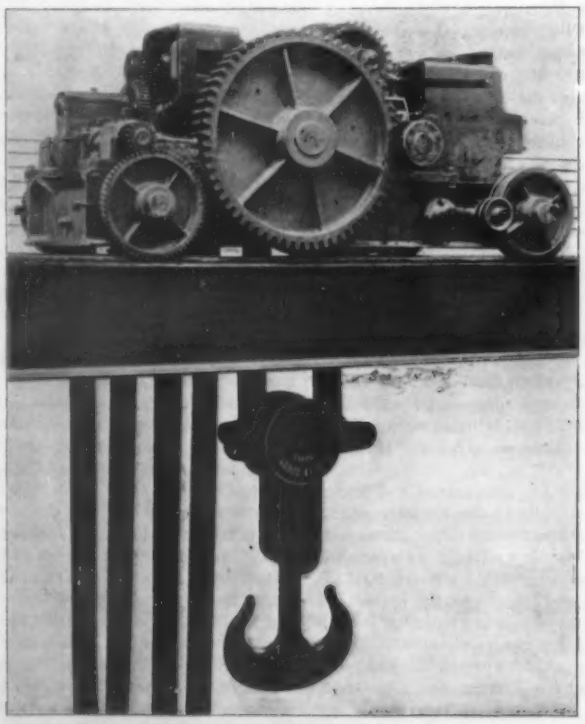


OERLIKON SUSPENDED ELECTRIC DRILL.

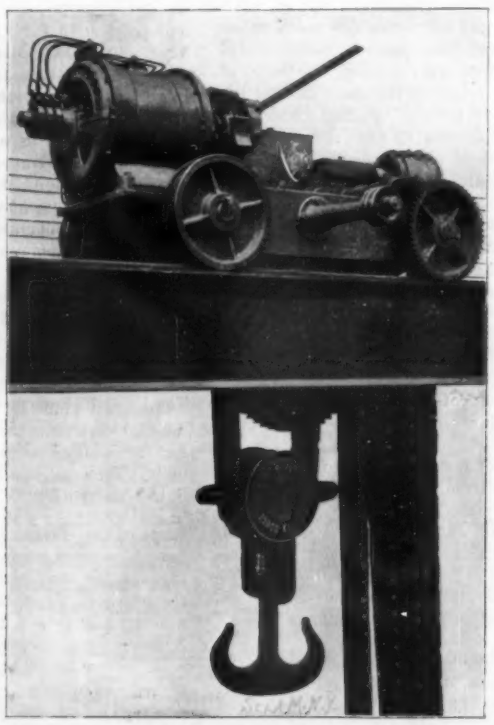
A New Valve Gear.

An ingenious new valve gear, especially for locomotives, the utilization of which results in a more economical consumption of steam than is possible under present conditions, has been devised by Mr. James Thompson Marshall, of Leeds, England. The most salient feature of the contrivance is the position of the eccentrics on the crank shaft. The leading eccentric is fixed 180 deg. in advance of the crank. The second eccentric is placed 90 deg. in advance of the first eccentric, and thus secures in combination with the crank three variations of speed. The first or leading eccentric is connected with the center of the radius link, and the second eccentric actuates a rocking shaft which communicates through the radius link and valve rod—the characteristic movement of the invention. This movement is different from the travel of the ordinary gear, since the valve rod instead of oscillating with regular rapidity, pauses at the end of each stroke both forward and backward, a sufficient time to permit in the one case, the maximum of steam to enter the cylinder, and in the second case, to give the steam ample time to escape. The economical advantages of this new gear are greatly increased haulage power, owing to the ease with which the steam is passed in and out of the cylinders, reduced steam pressure and a correspondingly smaller consumption of fuel, and a considerable reduction of "back pressure." "Back pressure" is one of the special troubles of the engineer. How to get the waste steam away quickly enough has long been a difficult problem. The difficulty has been largely solved by the Joy valve gear, but this invention differs from the Marshall contrivance in dispensing with eccentrics. In the case of the latter gear the valve remains stationary between its opening and closing movements, and thus on the one hand, the steam obtains freer entrance, and on the other, passes out more quickly than where the movement of the valve rod is constant and not variable. Similarly the blast is improved. Instead of a quick, jerky draught, there is a long sustained exhaust not so destructive to the fire. As to the mode of entry of the steam by the employment of the Marshall gear the liability of the motive fluid to be withdrawn is obviated. Frequently when steam enters a cylinder it does so at a pressure of 15 or 20 pounds below that indicated by the boiler. But with the Marshall gear the same pressure is gained in the cylinder as that indicated by the boiler.

The Great Northern Railroad has been experimenting with the gear upon one of its mineral traffic engines. The results were highly satisfactory, for in the trial the locomotive hauled from 30 to 45 trucks of coal at a saving of 8 pounds of fuel per mile, and under a steam pressure 20 pounds below normal. With a converted passenger engine running with a dining car express comprising 17 cars, 2 pounds of coal per mile is saved. The new valve gear works so satisfactorily that the driver can contrive to keep in reserve fully 30 pounds of steam.



FORTY-TON OERLIKON TRAVELING CRANE OPERATED BY DIRECT CURRENT MOTOR.



OERLIKON ELECTRIC CRANE OPERATED BY THREE-PHASE ALTERNATING CURRENT.

Bacteria on Mont Blanc.

In the Comptes Rendus of the Paris Academy of Sciences, M. Jean Binot prints an account of his researches in the observatory on the summit of Mont Blanc, where he has been conducting bacteriological investigations at the highest altitude yet explored. As was to be expected, the air on the summit, away from the observatory, contains scarcely any bacteria whatever, only from four to eleven being detected in as much as a thousand liters, while in somewhat similar volumes none whatever was found. As a rule, at lower altitudes, the number of bacteria increased, as, for instance, at the Plan de l'Aiguille fourteen, and at the Montanvert forty-nine were found in a thousand liters. Inside the observatory, in which M. Binot spent five days, from 260 to 540 microbes were found in the same volume of air, these being probably introduced by M. Binot and his companions during their temporary invasion of the building.

The investigations were not, however, confined to the air on the top of the mountain, but included also bacterial examinations of freshly-fallen snow, old snow, ice on the surface and below, glacier water, and mountain streams. Freshly-fallen snow, even when sampled in large quantities, frequently contained no bacteria whatever, while in snow which had lain for some time usually only from one to two individuals were discoverable per cubic centimeter; at the foot of the glaciers the surface snow contained rather more, the number varying from six to sixty-five per cubic centimeter at the Mer de Glace. Glacier water is usually very pure, and, like the glacier ice from which it is derived, was found to contain a number of yeasts and some streptothrix; but while high up such water contained but from three to eight bacteria per cubic centimeter, a stream at the foot of the glacier des Bossons contained ninety-five, while the water of the River Arve, at Chamonix, was found to have as many as 7550 per cubic centimeter. Altogether, M. Binot examined 121 samples of air, ice, snow, and water, and isolated no less than 300 different varieties of microbes, one-third of which number he was able to identify as having been already studied and described, and the residue are being carefully investigated by him at the present time. Even the alluring and beautifully clear and crystalline spring water on the Montanvert road was condemned by being found to contain a dozen virulent colon bacilli in a cubic centimeter. Doubtless, this pollution was due to the cattle on the mountain.

A large foghorn is to be placed in the cliff of St. Lawrence, 4 feet in diameter and 12 feet long, the sound being produced by sirens. Compressed air is supplied by valves actuated by clockwork. Every two minutes the foghorn will emit a deep roar, followed ten seconds later by a sharp shriek. There are three air tanks, each 6 feet in diameter and 12 feet long, and three gasoline engines run compressors to fill these tanks. The plant runs automatically, and a constant pressure is maintained in it. Even the clock is wound by a compressed-air motor. The horn is mounted on a revolving track, so that the sound can be directed toward any point.

THE NEW WHIPPLE TEMPERATURE INDICATOR FOR USE WITH PLATINUM THERMOMETERS.

The Cambridge Scientific Instrument Company, of Cambridge, England, are introducing a new temperature recorder, the "Whipple," of which we publish an illustration herewith. This temperature indicator is intended to be utilized with the Callendar platinum recorders. It was Prof. Callendar who drew the attention of the British Royal Society in 1886 to the possibility of measuring temperature based on the determination of the electrical resistance of a platinum wire, and demonstrated that the process was capable of very general application, and that the platinum resistance thermometer which he invented in co-operation with Prof. Griffiths gave consistent and accurate results over a very wide range of temperatures.

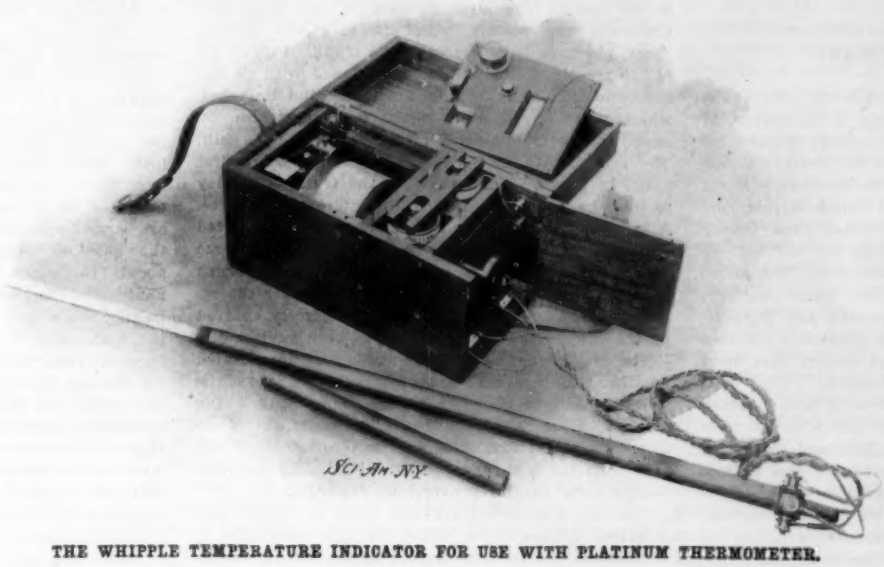
The Callendar and Griffiths platinum thermometer consists of a fine platinum wire, the resistance of which varies with the temperature. The coil of wire, generally called the bulb of the thermometer, is protected from the action of fumes and mechanical damage by means of a glass, steel, or porcelain tube, depending on the temperature it is required to register. Erroneous indication upon the recorder, owing to variations of the temperature, are rendered impossible by an arrangement of compensating leads. By this means the thermometer can be placed in positions where it would be absolutely impossible to read or use a mercury thermometer. At the same time a series of thermometers distributed over a wide area, can be read with infallible accuracy from one central point by means of an indicator and switchboard.

The Whipple temperature indicator is intended for employment with these platinum thermometers. The platinum coil constitutes one arm of a Wheatstone bridge, the other arms being formed by suitable resistances. The bridge wire differs from those generally used in connection with these indicators, since it is comparatively long, and is wound in a spiral round an ebonite drum as shown. Over this drum slides another graduated drum, the calibrations of which, however, are not regularly spaced, but are corrected so that the instruments read directly Centigrade. This last feature is the most prominent characteristic of this device over other types of indicators which have regular calibrations, and the temperatures are recorded in "platinum degrees" only, thus involving careful mathematical deductions to ascertain their Centigrade or Fahrenheit equivalents. Another distinct improvement in the Whipple apparatus is that rapidly varying temperatures may be followed with the utmost facility.

In our illustration the apparatus is shown with its top cover removed to explain the general arrangements of the mechanism. The battery power—dry-cells—is at the right, the calibrated drum in the center and the galvanometer at the left. The traveling contact is fixed inside the outer drum and presses on the spiral bridge below it. It is advanced by turning the large milled head shown at the right. In the illustration the apparatus is shown connected to the Callendar and Griffiths thermometers, which have a range from 0 deg. to 1400 deg. C.

When the top is adjusted in position only a portion of the temperature scale and the needle of the galvanometer are to be seen through small glazed apertures. The apparatus is very compact and is specially designed with a view to easy portability, the extreme dimensions of the case being 14 inches in length by 8 inches in width and 8 inches in thickness, while its total weight is only about 20 pounds.

The instrument is now used by the British Admiralty for temperature measurements of naval boilers.



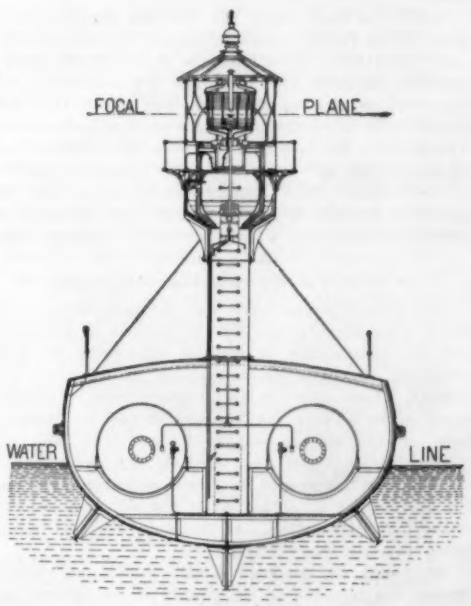
THE WHIPPLE TEMPERATURE INDICATOR FOR USE WITH PLATINUM THERMOMETER.

AN AUTOMATIC LIGHTSHIP.

BY WALDON FAWCETT.

During the past few years a radical improvement has been made over all previously existing systems of lighted signals by the use of gas-lighted buoys, supplied with tanks of compressed gas, which burn continuously day and night without attention for periods ranging from three months to a year, according to the size of the receptacle. The originators of this system have lately taken another step in advance, still further departing from the usual oceanic beacon, by the construction of a lightship which is independent of outside attention in the same degree as are the less powerful lights previously referred to.

The permanent lightship, as it might perhaps be designated, was built at Port Glasgow, Scotland, for a London firm of well-known lighting engineers, and has been stationed off the west coast of Scotland at the Otter Rock, near Islay, where it is subjected to great stress of weather at almost all seasons of the year. The steel hull, which is built of extra strength, is fitted with fin and web keels, three feet in depth, which are expected to co-operate with the extreme beam of the vessel to reduce rolling to a minimum.



CROSS SECTION OF THE LIGHTSHIP AT THE LANTERN.

By means of two steel, water-tight bulkheads, the vessel is divided into three water-tight compartments. The central division of the hold is occupied by two large welded steel gas tanks, which have a combined storage capacity for sufficient gas to supply the vessel for several months. Midway in the vessel is a circular steel tower surmounted by the lantern, which is thus given an altitude of twenty-five feet above the level of the water. The gas connections are carried on the inside of this tower, and there is also provided a ladder which affords access to the lantern for the supply men, who make periodical visits to the unmanned lightship.

The experiments already made with this system of maritime beacons prove conclusively that the light in the Otter Rock vessel can be depended upon to burn continuously and reliably for a number of months. The approximate duration of the light can always be predetermined, and there is no danger whatever of the light's being extinguished either by wind or spray. The gas is stored in the tanks in the hold at a pressure of 150 to 180 pounds per square inch, and a very efficient apparatus is provided for regulating the pressure to the burners. Surrounding the lantern is a platform on which an attendant may stand to light the beacon or adjust the flame. Within the tower is the fitting valve, by means of which connection is made to the tanks for the purpose of charging with gas, and this valve also controls the gas supply from the tanks to the lantern.

The light is given by a cluster of flat flames around a central jet, and the lantern is provided with a special lens which renders the light visible at a distance of from eight to twelve miles. Tanks are used to transport gas from the plant where it is manufactured to the lightship. When a supply vessel reaches the Otter Rock craft a hose is connected to the valve and to the source of supply, the valves at each end of the hose are opened, and the gas flows into the tank.

In order to enable the Otter Rock vessel to render service in warning imperiled vessels when there is a fog and when the light could not consequently be seen the craft is provided with a large bell, mounted on deck, which is made to ring automatically by means of a highly ingenious device which utilizes the gas as it passes from the tanks to the lantern to actuate the bell clapper. The bell is also provided with an ordinary tongue designed to be actuated by the roll of the vessel; but inasmuch as the water is usually comparatively quiet during the existence of a fog, this latter apparatus is of little value at the time when the sounding of the bell is most essential. The apparatus for ringing the bell by means of the flow of gas consists of a vessel covered by a flexible diaphragm. The pressure of the inflowing gas causes the diaphragm to rise, lifting a rod connected with a lever arm, to which hammers and counter-weights are attached. When a hammer has struck the bell the movement automatically stops the flow of gas to the space under the diaphragm and the latter falls back into its original position. Powerful springs also keep the hammers off the bell after impact and otherwise assist in the operation of the apparatus. There is never a possibility that force will be lacking to ring the bell so long as there is any gas whatever in the tanks, since it is possible with a con-

AUTOMATIC UNMANNED LIGHTSHIP AT THE OTTER ROCK, SCOTLAND.

sumption for light of but one cubic foot of gas an hour to get very forcible blows upon the bell at the rate of three a minute. As has been explained the lighting is not interfered with in the slightest degree by the operation of the bell-striking device. The gas, after having expended its force in ringing the bell, is supplied to the lantern, and the light burns and the bell rings day and night for months without attention.

A REDWOOD LUMBER PLANT.

BY ENOS BROWN.

One of the results of the prosperity which the State of California is now enjoying is the revival of the lumber interests and the remarkable demand for export of the product of its redwood forests. Conditions are quite unprecedented. The redwood is found only in California and in but a comparatively contracted area even there. From Santa Cruz county on the south to the Oregon line on the north it attains full development, but lower than Mendocino county, owing to vicinity of the great markets, the forests have been about exhausted and these localities are no longer considered producers. A considerable acreage in Santa Cruz county has been recently appropriated as public domain.

The available redwood, therefore, is now confined to about 318 miles of coast. The annual product, in this region, is about 320,000,000 feet, and it is estimated, at the present rate of consumption, that enough standing timber exists to last for 150 years.

The redwood is rarely found beyond the reach of the ocean fogs; its extreme limit being thirty-five miles inshore, and then only when some valley-like depression prevents the entrance of fog to that distance. The tree seems to have an affinity for the salt sea fog and attracts it about its lofty branches. There it condenses and falls to the ground in a gentle rain. The ground under the redwood tree is always moist.

The redwood is the *Sequoia sempervirens* of botanists and is distinct from the *Sequoia gigantea* of the Sierras. The first is never found far from the sea, the latter always on the declivities of the Sierra Nevadas and seldom at an altitude lower than 4000 feet, and in regions where the rainfall is never excessive. In size they are much alike. The few remaining groves of the *Sequoia gigantea* are in Mariposa and Calaveras counties, California, and some of them are 400 feet in height and of tremendous girth. The timber is inferior to that of the redwood, which is noted for endurance and strength. Its resistance to fire is no fable, but a sober fact. The lumber is becoming more in demand for decorative purposes. Its color, a light salmon when first cut, afterward turns to a deep red. When thoroughly dried there is no shrinkage and it readily yields to the chisel of the carver. Piano cases made from the wood are said to give increased resonance to the instrument. Large quantities are consumed for interior finishing with gratifying effects. In addition to other fine qualities the wood takes on a beautiful polish and even the stumpage, until recently considered worthless, is found to possess valuable qualities. The roots and woody excrescences at the base of the tree give fine effects in wavy outlines, and, when polished, the result is a material much valued for decorative purposes.

In the Eel River redwood district, Humboldt county, there are 80,000 acres of timber lands, which will produce at a low estimate 75,000 feet to the acre. In size the trees range from four to six feet in diameter; if below 18 inches they are left standing. Of the larger sizes from 8000 to 12,000 feet is produced from each tree.

The tree illustrated was a growth of this valley and produced 80,000 feet of merchantable lumber.

Felling one of these enormous trees is an operation requiring great experience on the part of the woodsman. In the first place, a tract is selected containing a goodly number of the proper sizes, as well as being advantageously located for getting the logs to the railroad for conveyance to the mill. The experience of the cutter will indicate the first and next in order to be felled. Each tree must lie in its own bed. A platform is then erected surrounding the trunk from 6 to 8 feet above the ground. With a saw an undercut is made through the trunk, not quite to the center, and from the opposite side a crosscut is sawed, ending a foot or two above the undercut and leaving a section of solid lumber between. The "gunsight," or the place where the tree is to fall, is then calculated to a certainty and the ground cleared of all projections that would prevent the great trunk from falling flat on the earth. The woodsman who cannot calculate within a few feet the exact spot where the extreme top of a tree, no matter the height, will lie when down does not know his business. The rule is that when ten per cent of a tree is "split" when felled, the chopper is incompetent and is discharged. When the exact place where the tree is to fall is selected, the choppers ascend the platform and with axes hew out an angular-shaped piece having the undercut as a base. When this cut is made the second or cross cut is wedged until the tree topples over and falls to the ground, the solid section of the trunk, not pierced by the cuts, supporting the tree until the center of gravity is passed, and then the mighty frame falls upon its prepared bed almost intact.

The next operation is performed by the "ringers" and "peelers." Every 12 or 14 feet, as required, a ring is cut around the circumference of the bark, and afterward the peelers with crowbars and wedges "peel" the bark from the prostrate trunk. Finally all of the trees are stripped but surrounded with an immense accumulation of debris of bark and branches, which must be removed before the trunks can be sawed into suitable lengths for conveyance to the mill. The ground is cleared by fire, precaution being first taken to plug up the "splits" in the trunk with clay so that the fire may not reach the interior of the tree. A foggy day is chosen and a still one. Fire is started and in a short time the tract is burning with a fierce heat, that quickly reduces the piles of bark and brush to ashes, and leaves an unobstructed field for the removal of the timber which has been scarcely charred by the intense heat to which it has been subjected.

The trunks as they lie are then cut into stated lengths with crosscut saws, and then follows the arduous task of conveying these enormously heavy sections to the railroad. This operation is one of extreme difficulty, involving the transportation of the logs from the high and precipitous hillsides and conveying them uninjured over long distances.

Temporary skidways are laid down and roads constructed. Chutes down which the logs pass have to be planned, and on these, guided by the skillful woodsmen, the unwieldy logs at last reach their destination. The work is laborious in the extreme and is assisted by donkey engines on sleds, which are hauled to the top of the steep banks and into seemingly impossible situations. With the aid of these engines loading on cars is accomplished without special difficulty. Twenty-five miles of broad gage track penetrate into all parts of this district and 180 flat cars are employed in transporting the timber and finished products.

Scotia, the town where the immense manufacturing plant of the Pacific Lumber Company is located, is situated twenty-five miles from the mouth of Eel River. Schools, churches and dwellings are owned by the company, as well as the land upon which they are built. It is a community prosperous and contented. The pond at the mill side has room for 4,000,000 feet of logs, which are drawn upon when the rains of the winter season render logging impracticable. The capacity of the mill is 175,000 feet per day, exclusive of 500,000 shingles and a large number of railroad ties.

A New Use for Wireless Telegraphy.

The United States Coast and Geodetic Survey has made some experiments for the purpose of ascertaining the adaptability of wireless telegraphy for telegraphing longitude determinations in localities like Alaska, where there are no telegraph lines. The tests were made between the Marconi station at Sagaponack, on the eastern end of Long Island, and the United States Coast and Geodetic Survey schooner. As the vessel proceeded westward messages were sent at half hourly intervals, until the schooner was 63 miles from the station. At that point the last intelligible message was received.

On board the schooner a circuit-breaking chronometer was included in the circuit of the battery and the spark coil. Each second-break of the chronometer was automatically transmitted as a time signal and recorded on a tape at the shore station. The results are said to show that regularly-spaced signals transmitted in this manner can be utilized for longitude determinations at a greater distance than is possible by verbal messages transmitted through the medium of the Morse code.

Disappearing Gun Tests.

At Fort Monroe, on the morning of July 24, the first of a series of tests of the disappearing type of gun carriage were begun. The first shot fired resulted in clogging the mechanism of the disappearing gun. It required no little time and trouble to get the gun back into battery. After the difficulty had been remedied, the tests were conducted successfully.

Five deliberate shots were fired, one at an extreme elevation, which severely strained both gun and mount. The projectile was hurled to a distance of eight miles. No effort was made to hit the targets, the purpose of the test being simply to ascertain the speed of firing.

In ten shots fired for speed, two minutes elapsed between the first and second; but only fifteen minutes and thirty-seven seconds were required from the loading of the first shot to the firing of the tenth round. Full service charges of seventy-two pounds of powder were used. The gun tested was Model 1888. The reports of further tests will be awaited with interest.

Santos-Dumont's New Airship at Brighton Beach.

At Brighton Beach, Coney Island, the airship which Santos-Dumont is to use in sailing around the Statue of Liberty in New York Harbor is nearing completion. Within a shed about 60 by 120 feet, with a height of 60 feet, the vessel of the Brazilian aeronaut is housed. The entire contrivance, including the frame-work to be suspended from the balloon, the car, and the motor, is the same as that used in the famous flight around the Eiffel Tower. The gas bag was made by Lachambre; the motor by Buchet.

The frame, which is somewhat shorter than the envelope, is made of cypress rods, about one and a half inches square, covered with aluminium thimbles at the splices, with trusses connecting the upper and lower bars. The entire frame tapers at each end and is stiffened with fine wire braces. The motor and the batteries which generate the current for the spark are carried approximately in the centers, together with the gasoline storage tanks. A propeller weighing about 115 pounds is carried at the stern. The aeronaut takes his position at the prow so as to counterbalance the weight at the stern. The entire weight of the frame and its equipment is about 2300 pounds. In order to govern the flight of the ship in respect of its altitude, a rod from which a long and heavy rope will trail is to be employed. The rope is to serve as a steadying agent in rising and as a retarder in alighting. It will also serve as a movable ballast, which, when shifted toward the stern, elevates the prow of the ship and causes it to rise, and when brought forward depresses the prow and causes the ship to descend.

King Edward's Automobile.

The Daimler Motor Company has delivered the new 24 horse power automobile made for King Edward VII. It was built at the Coventry works of the company. The most prominent features of the car are freedom from dust and steadiness in running—points to which the King has given personal attention in the designing. The dust nuisance is avoided by the deep body of the vehicle, which is of tonneau shape, and by the fitting of a glass back reaching to the canopy. The sides have storm curtains of royal blue to match the upholstery. The car is to hold six persons, with two in addition upon the driving seat. Although fitted with a powerful motor—a 24 horse power four-cylinder engine being incased in a bonnet at the foot of the car—the aim has been not to provide for high speed, but to secure steady traveling over all kinds of gradients. In the trial runs gradients of 1 in 90 were easily ascended at twelve miles an hour, without any sensible effort. The car at full speed travels at 36 miles an hour on the level. Particular attention has been paid to the brakes, which have under test stopped the car when far more heavily loaded than it will be in ordinary use. The brakes will hold the car, whether running backward or forward. Smoothness of running is facilitated by pneumatic tires of 5 inches diameter.

The Current Supplement.

The German Industrial Exposition at Duesseldorf, which is attracting such widespread attention in Europe, is interestingly described in the opening article of the current SUPPLEMENT, and some of its more important engineering exhibits illustrated. From the technological standpoint perhaps the most valuable contributions to the SUPPLEMENT are Auer von Welsbach's account of the discovery which has made his name world famous; Mr. Charles F. Dodge's exhaustive, illustrated discussion of sisal hemp culture in Yucatan; and an essay by Mr. John B. C. Kershaw on the "Electrolytic Production of Chlorates." Of a lighter nature are the descriptions of an "Automatic Danger Signal for Railways;" "Electric Waves and Their Effect on the Human Brain;" "An Electric Coal Cutter;" "Medical Literature;" Prof. Petrie's appreciation of "The Egyptian's Eye for Nature;" "Automobilism in Prussia;" "Why is New Bread Indigestible?" and "Bird Migration and Bird Song." The boy who is interested in electricity will no doubt find much that is interesting in Mr. Del Mar's full description of how to make a dry battery. Of scientific interest is the address of the retiring president of the Chemical Society of Washington, on "Problems in the Chemistry and Toxicology of Plant Substances." On the whole, the current SUPPLEMENT is one of the most diversified numbers that has appeared in some time.

Dr. Jacot-Guillarmod intends to climb some of the highest peaks in the Himalayas. His party consists of two Austrians and three Englishmen. The expedition left Trieste March 3, and reached Bombay on March 30. When last heard from the party was in Cashmere. The first summits to be attempted will be the Godwin Austen, 28,250 feet high, and the Dapsang, 28,265 feet high. The Himalayan mountaineering record is held by W. Conway, who climbed the Pioneer Peak, 21,000 feet in height, in 1892.

Science Notes.

An effort is being made to secure the establishment of a government biological station on the Great Lakes. The purpose of such a station is to investigate all the problems connected with the fisheries of these lakes throughout their whole extent, principally for the protection of the commercial fish.

According to a report from Consul-General Bittinger at Montreal, a natural soap mine has been discovered in the foothills near Ashcroft, British Columbia. A company has been formed to work it, and already 275 tons have been taken out. The composition of the soap seems to be about one-fifth borax. It is said there are 20,000 tons of the material in sight.

Prof. Henry A. Ward has announced the discovery of a great meteorite in western Mexico. The stone weighs over 50 tons; it is 13 feet and 1 inch in length, and lay buried by the terrific force of its own momentum nearly 20 feet in the earth. Small portions of the meteorite were broken off; the remainder was left intact for the time being. The cost of transporting the stone to the seacoast, 71 miles away, would have been more than $50,000.

The Geological Survey department has recently issued a number of topographical maps of interest. There are five sheets covering the State of Pennsylvania, which were made by the co-operation of the Geological Survey and the State authorities. Sheets have also been recently issued covering the States of New York, California, Utah and New Mexico. There has been a reissue of the maps covering the State of New Jersey. These are available to persons interested from the department at a cost of five cents per sheet.

A collection of butterflies, said to be the finest and largest in the world, has been recently acquired by the American Academy of Natural Sciences in New York. This collection was made by Dr. Herman Strecker of Reading, Pa., who died not long ago. It was purchased at a cost of $20,000, which was donated for the purpose by the Very Rev. Dean Hoffman, of New York. Dr. Strecker was a sculptor, and devoted himself to the collection and study of butterflies only as a recreation. There are several standard works on the subject compiled by Dr. Strecker.

Experiments by the government have shown that no matter what the process of cooking, meat loses a great deal of its bulk, owing to the evaporation of the water, which constitutes a large part of all flesh. This loss is greater in small pieces than in the larger ones. In a lean piece of beef weighing from one to one and three-quarters of a pound, the loss of weight was 45.6 per cent, while in a piece weighing from five to five and three-quarters pounds, the loss was only 39.8 per cent. The loss of nutrition is not nearly so great, however, as that of the weight would seem to indicate.

The report of the scientific expedition to the Siamese-Malay State of Talor, which was subsidized by the British government, has just been issued. The expedition is at present investigating the zoology of the caves in the limestone hills near Biserat. The caves are said to be numerous, and many of them extend for over a mile in length, and, in most cases, are very rich in fauna. It is anticipated that considerable light will be thrown on the history of cave-dwelling animals by these investigations. So far sufficient geographical data have been collected to permit the accurate mapping out of the highlands of the greater part of the north of the Malay Peninsula.

The recent discovery in North Wales of several valuable silver urns, gold rings, armlets and spoons, dating from about the year 1600, recalls to mind, writes an English correspondent, some interesting facts concerning the recovery of treasure trove. The year 1882 appears to have been the most prolific in these unexpected finds. In January of that year, while repairs were being carried out in a house at Broughton, the workmen unearthed a large leathern bag containing thirty crowns and several shillings of the reign of Charles II., James II. and Queen Anne. In the following month a discovery of great antiquarian interest was made at Vufarfre, Sweden, when a number of antique silver bowls were brought to light. They proved to be excellent examples of twelfth and thirteenth century work, and were covered with quaint inscriptions. Some months later a clay vessel full of Roman coins was found near Yeovil, Somersetshire, and, at about the same time, two hundred and fifty coins of Queen Anne's reign were found at Watford. The greatest discovery of the nineteenth century took place in December of the same year in an old house in the Rue Vieille de Temple, Paris. Upon its demolition a copper jar was found in one of the walls. It contained seven thousand eight hundred and eighty-two gold coins, worth nearly $30,000 as bullion, but to the collector their value was untold, for they belonged, numismatically, to the rarest reigns of France. In other parts of the house were found one thousand and ten coins of Jean le Bon; six thousand one hundred and ninety-nine of Charles V. and over five hundred pieces of other mints, the latter being alone valued at $150,000.

Engineering Notes.

A recent explosion with one of the fire engines of the London Fire Brigade burning liquid fuel, has proved that it is far safer to use oil with a low than a high flash-point. With the engine upon which the accident occurred, oil with a flash-point of 105 degrees was being used. The tubes of the engine appeared to have clogged, owing to the tendency which the oil has to carbonize rapidly. The fireman noticed that the burner was not acting properly, and was in the act of shutting off the supply when the oil fired back with such force that his hair and clothing were singed and his face and arm scorched. As the result of his experiments, the commanding officer now recommends the use of an oil with a flash-point of 85 degrees, which is both considerably cheaper and safer than the higher flash-point oil. The experiments with liquid fuel for fire engines have not, however, resulted in such an economy as was anticipated, but the advantages of oil over coal in other directions are so numerous, both for stationary and marine engines, that the adaptation of all the engines for liquid fuel is to be carried out.

Last year a mining expedition was organized by several English and German capitalists to explore the mineral districts of German East and British Africa, respectively, for the purpose of developing the rich mineral resources of these districts. For this object some extensive schemes involving the expenditure of millions of dollars are being prepared conjointly in London and Berlin. The main feature of the enterprise is the construction of several railroads throughout the various territories, to connect the Cape to Cairo Railway with the West Coast, and also in conjunction with the railways in existence in the already partially developed portions of the country to cross the continent, probably from Port Alexander on the west to Delagoa Bay on the east. Some of the most wealthy of British and German colonial capitalists are financing the scheme, and in regard to that part of it which applies to German Damaraland, the German government is interested, as concessionaires of the right conceded to an Anglo-German syndicate to search for and work the minerals of the district, including the copper mines of Otavi. Outside, however, of the district worked by the German South-West African Colonial Company, the period of this concession has expired, but the promoters have obtained a renewal of the right from the German government.

Messrs. Barry & Leslie, the well-known English civil engineers, who have been examining the stability of St. Paul's Cathedral, London, have now issued the report of their investigations. When Sir Christopher Wren erected the edifice he made elaborate precautions to insure thorough stability; but so extensive has been the undermining in the neighborhood of the building that its foundations have been impaired, and unless it is speedily renovated the cathedral will within a few years be absolutely unsafe. The whole of the south side of the cathedral has subsided. The evil has been growing for the better part of a century. Sewers have been driven through the gravel soil and have drained the moisture out of the ground. Consequently there is an alteration in conditions, and a subsidence, resultant on the vast weight of the cathedral, follows. The most serious menace to the stability of the structure is a huge sewer in Carter Lane nearby, which is nearly 11 feet in diameter. The whole wall of the south transept has tilted from the perpendicular to an extent varying from four to five inches. This defect has, however, been attended to. Complete renovation will cost, at the very least, $250,000. The amount of money annually expended for urgent repairs —the building is never free from scaffolding—and cleaning is about $90,000.

The late Mr. Cecil Rhodes repeatedly endeavored to arrange for his railroad from the Cape to Cairo to pass through the more prosperous and promising Congo Free State, but he was unable to obtain the necessary concession, and therefore selected the alternative route through German East Africa. Now, however, the necessary concession has been granted by the Congo Free State for the construction of the railroad, between the northern borders of Rhodesia, across Congo Free State territory, to Lake Kasali, on the navigable waters of the Lualaba, one of the head reaches of the Congo. It is provided by the contract that 40 per cent of the plant of the railway shall be purchased in Great Britain. Negotiations are in progress with a well-known firm of contractors for dispatching a railway survey party at an early date. The effect of this scheme will be to divert the route of the transcontinental railroad north of Zambesi, from which point, according to the present arrangement, it trends to the east toward Tanganyika and the great lakes. It will now be continued due north of Victoria Falls to the Congo border, whence for a distance of 350 miles it will continue due north through Kantanga to the most southerly navigable point on the Lualaba (Lake Kasali), whence there is navigable waterway to Stanleyville, on the upper Congo. Thence a railway is projected to Mahagi, on Lake Albert, with further water communication on the Nile.

Electrical Notes.

The employment of the incandescent lamp for the display and illumination of shop windows containing dry goods is generally considered safe, but several experiments that have recently been carried out prove this contention to be a fallacy. A number of 16 candle power incandescent lamps were enveloped in raw cotton, and at the end of a few minutes the material commenced to smoke. Directly a draught of air, such as is caused by the opening of a door, came into contact with the cotton, it burst into flames, and the bulb of the incandescent lamp immediately collapsed. Investigation as to the cause of this peculiarity showed that the thin glass shell of the bulb of the lamp softened under the influence of the heat gathered by the cotton from the incandescent filament, and when the draught of air came into contact with the lamp, the softened glass caved in under the air pressure, so that the filament fired the glowing material. In view of these interesting experiments, caution should be observed not to place cotton or similar fabrics too near an incandescent lamp, as is often done for decorative effect, otherwise great risk of a fire breaking out is incurred. The liability of combustion from this cause is further accentuated where incandescent lamps covered with a colored varnish are employed, as the varnish affords a stronger incentive to combustion.

A method of replacing the ordinary anæsthetics used in dental surgery by the action of high-frequency currents has been brought out by Messrs. Regnier & Didsbury, of Paris. M. d'Arsonval has already shown that high-tension and high-frequency currents have a local anæsthetic effect, and the experimenters wished to see whether this could not be used to advantage for dental operations, and so do away with the inhalations of gas, which are not without danger to the patient. In the case of extraction they found it to work quite successfully. A d'Arsonval-Gaiffe apparatus was used, having a coil which gave a 1.2-inch spark, with a rotary interrupter and an oil condenser. The apparatus is connected to an Oudin resonator, one of whose terminals is joined by a flexible cord to an electrode fixed upon the jaw. The electrode is molded in plastic material and covered inside by metallic powder and a layer of tinfoil. Under these conditions the current gave the patient no sensation other than a slight heating in the region covered by the electrodes. It was found that a tooth with one root was made completely insensible by the application of a current of 150 milliamperes for 3 to 5 minutes, while the larger teeth needed 200 to 250 milliamperes for 6 to 8 minutes. As to the use of the method for more prolonged operations, the experiments are not as yet conclusive, although they are favorable on the whole.

At a meeting of the Royal Institution on February 2, it was announced that the following valuable relics of Michael Faraday, bequeathed to the Royal Institution of Great Britain by the late Mr. Thomas J. F. Deacon, of Newcastle-on-Tyne, had been received: Medals of silver and bronze (numbering 20 in all) and including the Fuller medal of 1828, two Copley medals of 1832 and 1838, two Newton medals of the Royal Society, 1833 and 1838, and the Rumford medal of 1846; two foreign orders contained in a small mahogany box; a book of portraits and autographs, including original letters from the Prince of Wales and Prince Alfred (written in 1856), Louis Napoleon, Emperor of France, Humphry Davy, Thomas Young, Humboldt, John Dalton, Whewell, Mary Somerville and many others; a daguerreotype of a consultation of Faraday with Prof. Daniell; a drawing in colors of the laboratory of the Royal Institution by a niece of Sir John Moore; and a manuscript book entitled "A Class Book for the Reception of Mental Exercises instituted July, 1818," containing contributions by Faraday. The late Mr. Deacon requested that the medals and orders should be preserved, with an inscription showing that Margery Ann Reid and Caroline Deacon (née Reid), nieces of Faraday's wife, often lived with Faraday and his wife during the most brilliant period of his life, and are mentioned in Dr. Bence Jones' "Life of Faraday."

A new electric car has been undergoing severe tests in England, the results of which have been highly satisfactory, as the vehicle has succeeded in covering 100 miles without recharging. The car itself is made by Kriéger, of Paris, but the electrical fittings are supplied by a London firm. The electrical installation consists of two compound motors, which drive the front wheels independently. The battery comprises 44 Leitner cells, of 300 ampere hours capacity, and is capable of running the car 100 miles without recharging at a speed of 40 miles per hour on a level road. When traveling down hill the motors are reversed and become generators and recharge the battery. Another interesting feature of this arrangement is that by converting the motors into generators an excellent braking effect is produced, and in the majority of instances is sufficient to hold the vehicle in check, without necessitating the application of the mechanical brakes.

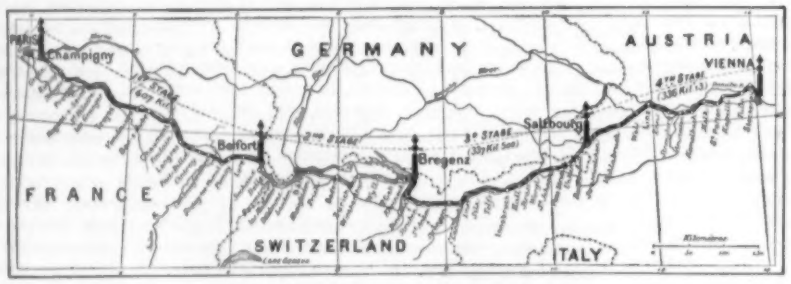
THE PARIS-VIENNA AUTOMOBILE RACE.

BY OUR PARIS CORRESPONDENT.

The Paris-Vienna automobile race has been an event of unusual interest. It was organized by the Automobile Club of France, the Swiss and the Austrian clubs, as the route lay through all three countries. The route was divided into four stages, to be covered in four successive days, starting on the 26th of June. The first stage lay through France, from Paris to Belfort, on the frontier, a distance of 253 miles; the second, from Belfort to Bregenz, comprised the part passing through Switzerland, or 238 miles, while the Austrian part included Bregenz-Salzburg and Salzburg-Vienna, 191 and 208 miles respectively. The total distance was therefore 890 miles. The whole of the route through Switzerland was neutralized; that is, the chauffeurs were obliged to cover the route, but the time was not counted in the general classification. The same was also true of most of the large towns passed through. An additional interest was afforded by the fact that the race for the Gordon Bennett Cup was held at the same time over part of the route, and its competitors had a chance to win both races. It included Paris-Belfort and Bregenz-Innsbrück, or a total of 383 miles. It will be remembered that this cup was offered by Mr. James Gordon Bennett for an annual international race in which the automobiles, each entirely of home make, should cover a minimum of 310 miles; the cup to be held by the automobile club whose champion won the race. Charron was the first to win it in 1900 on a Panhard & Levassor racing car, and last year it was won by Girardot over the Paris-Bordeaux route. He made the 327 miles in a little under 9 hours, or an average of 36 miles an hour.

The result of the Paris-Vienna race was determined, perhaps more than any other, by the peculiar conditions of the route to be covered. The part lying through France is a fine stretch of road which allows the cars to make their full speed. Through Switzerland the road is in fair condition, but often mounts and descends in heavy grades, winding along the mountain side. On leaving the Swiss frontier the ascent of the Arlberg commences, with its grades of 15 and 18 per cent winding up the mountains and reaching high altitudes. The snow which lay along the route in many places had to be cleared away to give space for the automobiles to pass. After a steep descent from the mountain, the road from thence to Vienna is very bad, being not only in poor condition, but also crossed by a series of drains and culverts which are the terror of chauffeurs. Only the best and most solid vehicles can stand the series of shocks caused by these constructions and a high speed cannot be reached without great danger to the machines. The race over this part of the route may be said to be one of endurance rather than speed.

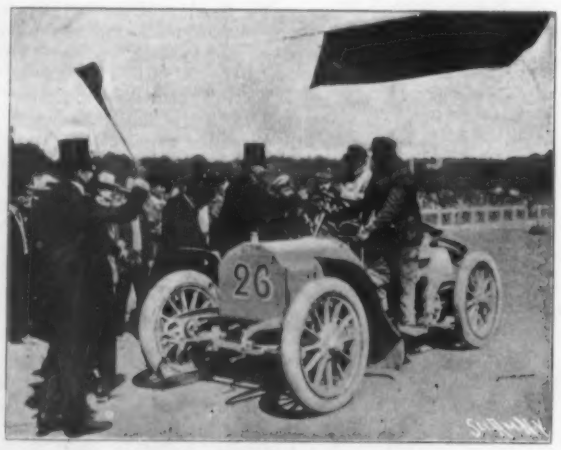
The Start of the Paris-Vienna Race.



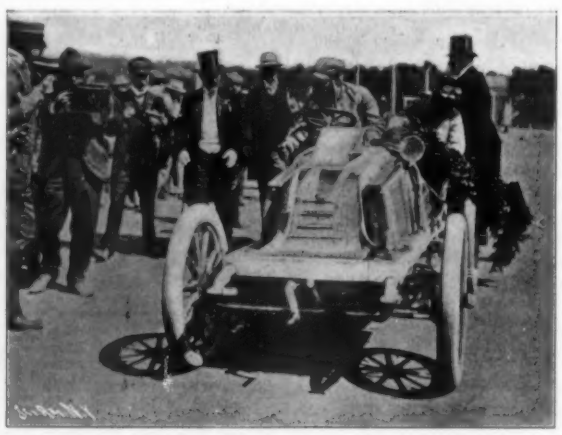
The Route of the Paris-Vienna Race.

The start was made from the Fort de Champigny, near Paris, at 3:30 A. M., but at this early hour an immense crowd had gathered. The competitors for the Gordon Bennett Cup started first; Girardot led off, mounted on a Charron, Girardot & Voigt car, then came Fournier on a Mors, and Réné de Knyff on a Panhard & Levassor. The only other country represented was Great Britain, whose champion, S. F. Edge, mounted a heavy Napier machine. After this came the regular racers, 120 in all, starting at two-minute intervals. In the Paris-Belfort stage, which allowed the best speeds to be attained, Réné de Knyff carried off the honors, surpassing the famous average of Fournier in Paris-Bordeaux of 53 miles an hour. De Knyff covered the 236 miles (deducting the neutralizations) in 4 h. 16 min., which gives an average of 56 miles an hour. As his Panhard car used alcohol he thus gained the Prince d'Arenberg Cup for the first alcohol car to reach Belfort. This part of the race was the most interesting as regards speed, and some of the racers who were chronometered over a short distance, De Knyff, Fournier and Farman, made over 75 miles an hour. Neither Girardot nor Fournier was able to reach Belfort, however, owing to accidents.

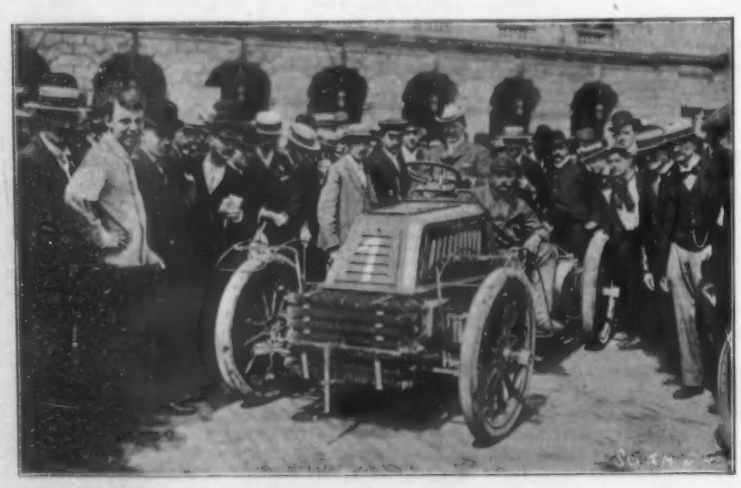
After Switzerland was passed, the next stage, which was the final for the Gordon Bennett Cup, was contested by De Knyff and Edge. The former succeeded in crossing the Arlberg without difficulty, but came to grief on one of the famous "caniveaux," or drains, and his differential was broken by the shock within only 30 miles of the finish. This allowed Edge to arrive at Innsbrück and win the cup, although he had taken over 10 hours to cover



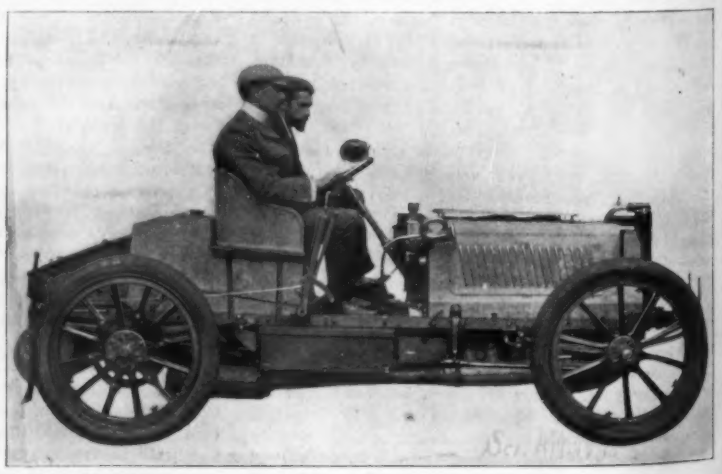
Arrival of Zborowski at Vienna.



Renault, the Winner, as He Arrived at Vienna.



Fournier, in His Mors Car, in Front of the Automobile Club, Paris.

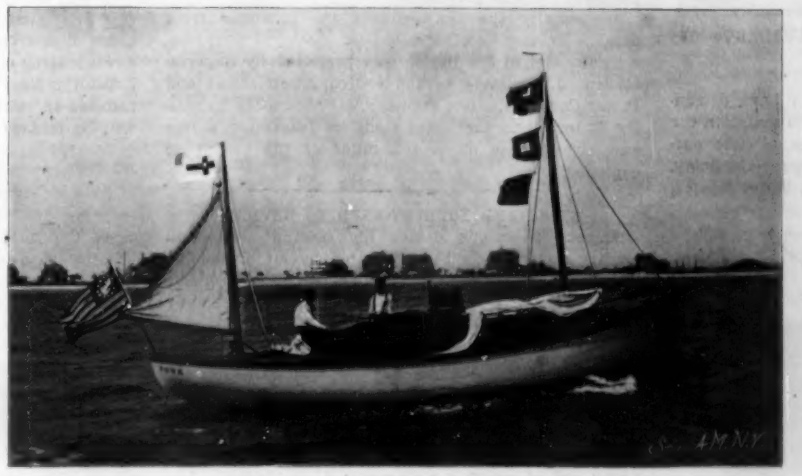


Mr. S. F. Edge and M. Napier in the Car That Won the Gordon-Bennett Cup.

THE PARIS-VIENNA AUTOMOBILE RACE.

the total of 383 miles. In the final heat from Salzburg to Vienna there were only 77 competitors left. The race seemed to be between the heavy Mercedes cars of German make, mounted by Count de Zborowski and De Forest, and the French racers, the Panhard cars mounted by H. Farman, Pinson and Teste, and the Darracq, conducted by Edmond. At Vienna more than 20,000 persons were assembled at the Hippodrome to see the finish. Contrary to expectation it was Marcel Renault, on a light automobile of Renault make, who arrived first, covering the total distance in 26 h. 22 min. 43 sec. The next best record was made by H. Farman (26 h. 36 min. 30 sec.), followed at intervals of a few seconds by Edmond and Zborowski. The chauffeurs received an enthusiastic ovation by the crowd, but the Austrians were a little disappointed that Zborowski had not come first. Renault won the prize of honor offered by the Emperor Francis Joseph to the French racer who arrived first, and President Loubet offered a similar prize to the first foreign chauffeur, which fell to Zborowski. The prize offered by the Prince de Furstenberg for the first car to enter Vienna was also won by Renault.

The Paris-Vienna race has been an instructive one for automobile constructors. The French machines are in general of a light and powerful build and are admirably adapted for the fine roads of the country, but are at a decided disadvantage when called upon to meet the trying conditions of the Austrian roads. It was thought at first that the heavier built German cars would take the lead, but the result shows that the Mercedes car ranked only fourth, and was preceded by the Renault and two Panhard machines. Another point to be remarked is that the Gordon Bennett Cup now passes out of France for the first time, and this will make the next year's race all the more interesting.



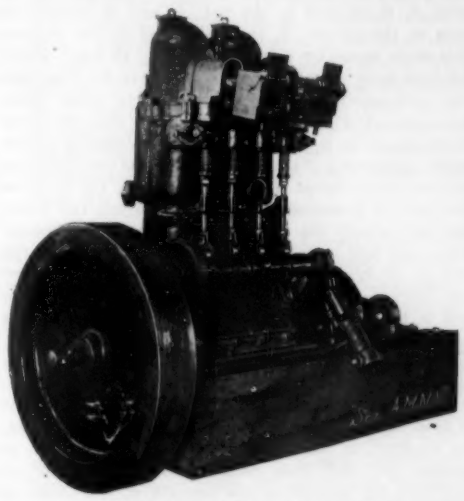
THE KEROSENE LAUNCH NOW CROSSING THE ATLANTIC

A TRIP ACROSS THE ATLANTIC IN A KEROSENE BOAT.

Mr. A. A. Low, a brother of the Mayor of New York city, has developed an invention of Mr. Feodor C. Hirsch, in which, by the novel method of injecting kerosene into a previously heated bulb, power is generated without water. In order to prove the great efficiency of an engine of this type, the New York Kerosene Oil Engine Company has built and equipped a 38-foot launch with a 10 horse power engine. On July 11 this launch started from College Point for Falmouth, England, by way of Sandy Hook.

The old tea house of A. A. Low & Brother owned many ships in the halcyon days of the three-masted clipper. The founder of the house, the late Abiel Abbot Low, carried the United States flag and three-striped firm flag with its "L" to all parts of the globe. The little kerosene launch carries the same emblems.

By the time this paper reaches our readers the little launch may have reached its destination; for Capt. Newman and his sixteen-year-old son, who constitute the craft's entire crew, hope to reach England in about twenty days.



THE MOTOR OF THE LAUNCH.

THE REMORA OR SUCKING-FISHES.

BY R. I. GEARE.

Sucking fishes have the unenviable reputation of going through life as hangers-on to fishes of larger growth, notably sharks, swordfishes and bull-fishes. Like some human beings, they prefer to have their food found for them—too lazy to do their own skirmishing in the struggle for life; and to accomplish their end they attach themselves to the gill-covers or sides of larger fishes with their first dorsal fin (the fin on the back nearest the head).

As they are excellent swimmers, there seems to be no good reason why they should become a burden to others, but it is well known that they travel with their unwilling hosts continuously in this manner, and the latter have often been found emaciated and thoroughly exhausted from the strain of pulling these uninvited guests around. From careful observation it appears that the object of the suckers beyond doubt is to share with their hosts the food which the latter find.

The Remora was one of the first fishes observed by the discoverers of North America, and history tells us that the Indians used them as baits to catch other fish. Thus in Ogilby's "America" the following reference to them is found in speaking of the fishes observed about the West Indian islands:

"Columbus from hence (Cuba) proceeding on further Westward discovered a fruitful coast, verging the Mouth of a River, whose water runs Boyling into the Sea. Somewhat further he saw very strange Fishes, especially of the Guiacan, not unlike an Eel, but with an Extraordinary great Head, over which hangs a Skin like a Bag. This Fish is the Natives' Fisher; for, having a Line or handsom Cord fastened about him, so soon as a Turtel, or any other of his Prey, comes above Water, they give him Line; whereupon the Guiacan like an Arrow out of a Bowe, shoots toward the other Fish, and then gathering the Mouth of the Bag on his Head like a Purse-net, holds them so fast, that he lets not loose till hal'd up out of the Water."

The natural feeling of antipathy against this class of fishes is heightened by the fact that they are not considered fit to eat, but there is a grim satisfaction in the knowledge that the propensity for fastening themselves on others has been utilized against them in making them catch sea animals for the benefit of man.

The illustrations, which are from photographs belonging to the National Museum, show one of these sucking-fishes alone, and one attached to a shark.

THE SUCKING FISH.

SUCKING-FISH ATTACHED TO A SHARK.

The Great Cork Forests of Spain.

The cork forests of Spain cover an area of 620,000 square miles, producing the finest cork in the world. These forests exist in groups and cover wide belts of territory, those in the region of Catalonia and part of Barcelona being considered the first in importance. Although the cork forests of Estremadura and Andalusia yield cork of a much quicker growth and possessing some excellent qualities, its consistency is less rigid and on this account it does not enjoy the high reputation which the cork of Catalonia does.

In Spain and Portugal, where the cork tree, or *Quercus suber*, is indigenous, it attains to a height varying from 35 to 60 feet and the trunk to a diameter of 30 to 36 inches. This species of the evergreen oak is often heavily caparisoned with wide-spreading branches clothed with ovate oblong evergreen leaves, downy underneath, and the leaves slightly serrated. Annually, between April and May, it produces a flower of yellowish color, succeeded by acorns. Over 30,000 square miles in Portugal are devoted to the cultivation of cork trees, though the tree actually abounds in every part of the country.

The methods in vogue in barking and harvesting the cork in Spain and Portugal are virtually the same. The barking operation is effected when the tree has acquired sufficient strength to withstand the rough handling it receives during the operation, which takes place when it has attained the fifteenth year of its growth. After the first stripping the tree is left in this juvenescent state to regenerate, subsequent strippings being effected at intervals of not less than three years, and under this process the tree will continue to thrive and bear for upward of 150 years.—The Boston Herald.

A New Oil-Carrying Fleet.

The Standard Oil Company is to have built in England a fleet of twelve steamships of the "Kennebec" type for the Eastern trade. If two trips a year are made by each of these vessels, it will be possible to ship 48,000,000 gallons of oil to China and Japan during the year. This amount would be equivalent to an eighth of the total amount of oil exported to foreign ports from Philadelphia. It is probable that the use of this large fleet will drive sailing oil-ships to seek other business.

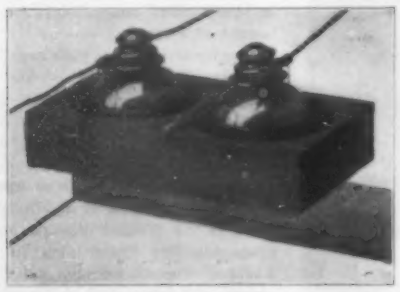
Benjamin Arnold, of East Greenwich, R. I., died recently after a short illness. He was an inventor of wide repute. He was born in 1822 and was educated at the Friends' High School in Philadelphia, and also at the Franklin Institute in the same city. The most useful and prominent of his inventions was a netting machine for making seines from either linen or cotton, the patent for which he disposed of to the firm of William E. Hooper & Sons, of Baltimore, Md., which firm also purchased a number of his other patents for doing the same character of work.

Patent Department

INSULATOR FOR LINES CARRYING CURRENTS OF HIGH VOLTAGE.

BY W. B. GREENWOOD.

Tests made near Santa Monica, Cal., have demonstrated the utility of a device designed to maintain the insulation of long-distance high-voltage electric currents. The United Electric Gas and Power Company, from its central power house located at Santa Monica,



INSULATOR FOR LINES CARRYING CURRENTS OF HIGH VOLTAGE.

supplies current for lighting and power purposes to Long Beach, San Pedro, Terminal Island and Redondo. The total length of the circuit is forty-five miles. The current is generated by direct-connected units at a pressure of 2300 volts. By means of transformers this pressure is raised to 22,000 volts and transmitted over the circuit to the different towns, and by means of step-down transformers it is lowered again to 2300 volts.

Ever since the installation of this system eighteen months ago the company has experienced the greatest difficulty in keeping the current from "slopping over" and burning off the pins. That is on account of fogs along the coast. The insulators used are of the types known as "No. 1 Provo" and "Lock," both of 60,000-volt glass. It was found that the leakage was not due to any fault of the insulation of the glass, but to the action of the fog. This was demonstrated by the fact that the line worked perfectly in wet weather. In dry weather dust would accumulate under the bell. In time of fog the damp atmosphere as it moved past the insulator would deposit moisture with the dust and form a sort of paste, which appeared to establish a good conductor for the high-tension currents to flash across. Within a short time the pin would be burnt off. The wire, dropping on to the cross arm, would burn it off and, in almost all cases, would next swing in against the pole and burn it off.

After having tried almost every conceivable scheme to overcome this serious trouble the company hit upon the novel device for housing or fencing in the pin and glass. The new arrangement, which has been shown by tests to have completely overcome the leakage and to have thereby prevented the burning off of the pins, is a box made of 1-inch wood 12 inches square and 4 inches thick. The box has on its upper side a round hole 10 inches in diameter. The device is placed so that the 7-inch bell of the insulator projects down a little into the hole. The box is previously treated with gas tar and has holes in its bottom sufficient for drainage. By preserving the static condition of the air under the bell of the insulator the deposit of moisture there is prevented.

Incidentally the box protects the insulator from damage by shot or other missiles.

The model of the device was perfected by Superintendent J. J. Davis, of the United Electric Gas and Power Company. The company, satisfied as to its utility, is installing the boxes along its transmission line and already has about ten miles of the circuit so equipped.

AN INGENIOUS POULTRY-FEEDING DEVICE.

STOCK AND POULTRY-FEEDING DEVICE.

A very ingenious device for feeding stock and poultry has recently been invented by Mr. Zachariah Xevers, of Santa Cruz, Cal. Briefly the device consists of a hopper or magazine from which feed is automatically discharged by action of a bait-box operated by an animal in its effort to reach the bait.

Our illustration shows the device as adapted for the use of poultry. A hopper for the grain is supported on legs at a suitable distance from the ground. An elongated opening, *E*, is formed in the bottom of this hopper. This opening is covered by a hood, *B*, at the upper end of which a swing rod, *A*, is pivoted. The swing rod passes downward through the opening, *E*, and supports the bait-box, *L*, near the ground. A slide, *F*, is secured to the rod, *A*, and is adapted to slide in the guides, *N*, in the bottom of the hopper. This slide normally closes an opening through which the feed falls when the device is operated. The bait-box, *L*, is provided with two cups, *M*, in which grain is placed. A wire netting covers each cup, the mesh of which is too small to permit the extraction of the grain. Assuming that the flock of fowls surround the bait-box, being called by the male bird of the flock, as the grain is protected by the screen covers, the fowls, and particularly the rooster, will peck at the covered grain, and the male bird may possibly hop upon the bait-box to scratch over the grain. It will be seen that the natural efforts of the fowls to get at the food held in the bait-box will impart a swinging movement thereto. The pendulum motion given to the rod, *A*, by the efforts of the fowl will move the slide, *F*, back and forth, consequently opening and closing the aperture in the hopper bottom, and permitting the food to drop into the chute, *G*, and thence to the ground. An agitator, *D*, fastened to the rod, *A*, serves to prevent the feed from packing. A regulator, *C*, is employed for regulating the amount of discharge at each oscillation. This can be secured at any desired position on the rod, *A*, by tightening the thumb screw, *K*. It is evident that by sliding this regulator toward the hopper, the length of the oscillation will be diminished, being checked by the prongs which engage the bottom of the hopper.

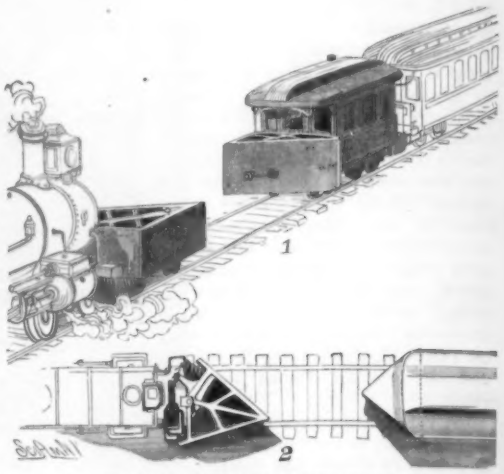
For pigs, rabbits or other animals, the cup, *P*, is used in place of the bait-box, *L*. This cup is slipped onto the end of the rod, *A*, and is fastened by bolt, *T*, which passes through the rod and both walls of the cup. The size of the cup prevents the bait from being reached, and in its effort to get the food, the animal will cause the oscillation of rod, *A*, and the discharge of a suitable amount of feed from the hopper above.

ANTI-TELESCOPING TRAIN GUARD.

In railroad accidents the most serious loss of life usually results from the telescoping of trains. Such accidents are continually occurring, and the list of killed and injured is always appalling. We are familiar also with other forms of accidents in which the locomotives leap onto the tops of passenger cars, crushing and grinding them and their occupants. Of much less serious importance are accidents caused by the derailment of a train. In such cases the locomotive and cars merely bump along the ties until their momentum is exhausted, or at worst the train may be overturned. Obviously, then, if some device were invented whereby derailment could always be substituted for the telescoping or crushing of trains, such a device would greatly lessen the danger of railway travel. Aside from this, cars or locomotives if derailed suffer ordinarily but slight injury, and can be easily righted and repaired, while if telescoped or crushed they are a dead loss to the railroad company.

We illustrate herewith two inventions of Mr. Weldon B. Heyburn, of Wallace, Idaho, which are adapted to accomplish this very result. In the first form it will be seen that the locomotive is provided with a heavy pilot having vertical faces, and that the front face is diagonally disposed entirely across the track. The pilot is preferably supported on trucks, so as to relieve the engine of its extra weight. In case of a head-on collision between two locomotives thus equipped, these diagonal faces would cause a sidewise shift of the engine, which would effectually avoid telescoping or "rearing." As a protection against rear-end collisions, a similar guard could be attached to the rear car of the train, or better yet, a special car might be built according to the design illustrated, in which the guard has a permanent jointed connection with the car. Some suitable coupling attachment such as shown could be provided for use in drilling or switching this car about.

It will occur to some of our readers perhaps that this arrangement of guards might in some instances cause disastrous results, such as throwing a train down a steep embankment. In order to overcome this difficulty, Mr. Heyburn has devised the second arrangement, which is shown in plan view. Here it will be noticed that the guard is provided with a V-



ANTI-TELESCOPING TRAIN GUARD.

shaped impact surface, and that the guard on the locomotive is capable of adjustment to the one side or the other. Normally this pilot or guard will be held, by strong coil springs, with its point midway of the track. A cylinder on the locomotive, which is shown in section, is provided with a piston connected to an arm on the pilot. This piston may be operated by steam, but will preferably be operated from the compressed-air system of the train. Suitable connections are provided, whereby the engineer may admit the compressed air to one side or the other of the piston-head, so that in event of an impending collision he may quickly swing the pilot to one side or the other, thus choosing the most favorable side for the derailment.

NECK-YOKE ATTACHMENT.

An improved method of securing a neck-yoke to the tongue of a vehicle has recently been invented by Mr. David M. Luse, of Chinook, Mont. Briefly stated, the invention provides in connection with a neck-yoke a sleeve to fit and be secured on the tip end of the vehicle tongue. This coupling-sleeve is provided at its front end with a brace-band spaced at its upper side away from the sleeve, to receive devices which connect it with the neck-yoke. Two constructions are illustrated; that in Figs. 1 and 2 is adapted specially for buggies, while the other figures illustrate a form preferably used on wagon tongues. In Fig. 1 the parts are assembled, while in Fig. 2 the tongue is shown

NECK YOKE ATTACHMENT.

disconnected from the coupling device. The neck-yoke is provided with a cross-bar to which the coupling-sleeve is secured by means of a strap connecting the cross-bar with the brace-band of the sleeve. By connecting the strap directly with the brace-ring, the coupling-sleeve is relieved in a great measure of the strain and may be made light and present a neat appearance, as is desired in buggies. It will be seen that the end of the tongue is tipped with a thimble shouldered near the rear end. This thimble is provided with a bayonet slot adapted to receive the pin in the coupling-sleeve and lock the same to the buggy tongue; this is readily accomplished by slipping the coupling-sleeve onto the tongue and then partially turning it. When the parts are so connected, there is no projection of the pole beyond the neck-yoke connection. Thus are avoided the difficulties resulting from the catching of the check-reins over the end of the pole and numerous other annoyances which are commonly experienced with the ordinary neck-yoke connection. At the same time the pole is provided with a neat, attractive, safe and noiseless neck-yoke, as desired for use on carriages.

The second form of this attachment is shown assembled in Fig. 3. This construction is stronger and better adapted for heavy work. The coupling-sleeve is fastened to the neck-yoke by chains, and is secured to the wagon tongue by a pin which passes through openings in the sleeve and the tongue. The openings in the coupling-sleeve may be seen in Fig. 4, in which the attachment is swung around to better show their locations. It will be noticed that by withdrawing the pin the neck-yoke can be readily detached from the pole without removing the neck-yoke from the team.

Brief Notes Concerning Patents.

Among the recent deaths of note is that of William S. Post, who was well known among the manufacturers of mechanical appliances in Boston, Mass., where he lived and worked. Among the more important of his inventions was a refrigerator car, a down-draft furnace and the Post combustion boiler.

A means for automatically inserting a fuse in an electric circuit has been recently patented by James T. Watson, of Scranton, Pa. It is a magazine fuse holder, and the number of fuses available is only limited by the size of the box which incases the apparatus. When the fuse blows the holder drops by its own weight, allowing the next holder to fall into place, thereby closing the circuit again.

A graphophone in which several records are employed is the invention of E. P. Felt, of Elida, Minn. The stylus and reproducer are disengaged from operative connection with the records at the terminal of the latter in an automatic manner, and returned to a starting position. A motor device for controlling these operations is equipped with certain co-operating devices, which are proportioned and arranged to carry out the several steps.

A patent has recently been granted for a combined phonograph and illustrating device, by means of which a series of pictures representing the subject matter of a phonograph record can be exhibited as the sound is reproduced. A series of pictures are mounted on a carrier, and are arranged to travel in succession, and displayed in a path focused with reference to stereoscopic eyeglasses. The carrier is automatically actuated from a moving part of the phonograph.

Authorization has been given by Congress to Patent Commissioner Allen to make an addition of forty clerks and examiners to the corps now employed in his department. This will greatly facilitate the work of this important department, and will enable the Commissioner to keep abreast of the applications. For many years the department has been far behind in the examination of applications, but under the last administration and the present one much has been done to bring the work up to date. At present, however, the force is 10,000 applications behind, but it is hoped to dispose of these by working overtime. The new positions will be filled by civil service examinations.

Sir Howard Grubb, the well-known English astronomical engineer, in conjunction with Mr. A. T. Lawson, of London, has invented a new improved gun sight for large guns and rifles. In this invention the mounting comprises a sight-carrying device that is pivoted to a suitable support, or carrier, attached to the gun or its cradle or mounting, and is adapted, together with the sight carried thereby, to be raised and lowered in a vertical plane about the pivot as a center by a cam. In connection with the latter is a wheel or drum bearing a scale of ranges or degrees, or both, the arrangement being such that the sight-carrying device will at all times hold the sight in a steady manner both laterally and vertically. By rotating the cam the sight-carrying device with sight can be easily and accurately adjusted in a vertical direction to suit requirement. The sight-carrying device and the sighting device may be made, if necessary, as one article.

Legal Notes.

DAMAGES FOR INFRINGEMENT.—In the case of Coddington vs. Propfe et al. (112 Fed. Rep. 1016), a suit for infringement of a patent on sealing wax, the question of how to estimate the damages brought out an interesting point. Defendant had used the patented composition in connection with a string, selling the waxed strings for a finished product, and contended that the damages should not be based on the value of the finished product, but rather on the value of the amount of composition used separate and apart from the string. The string device had once borne a patent, but this had expired. The opinion of the court so far as it covered this point is as follows: "It may be that during the life of the patent, had the defendant used the string device of that patentee and the wax composition of this one, the profits would have had to be apportioned. But the wax string has now gone into common use, and does not necessarily contribute anything to the salable value because of its original patented character. It is like a hundred other things which have originated in the same way, and now have a standing in the market only by reason of some new and special feature added to them. The marketable commodity in the present instance is distinctively the waxed string of which the thread has no value by itself, but derives its whole character and value from the wax which covers it. The purchaser buys it for the wax, and not for the wick or thread on which it is strung, just as he would buy it in sticks or cakes or any other form which suited him. The case therefore falls, in my judgment, within the rule, which is abundantly sustained by the authorities, that where, but for the patented feature, an article made and sold by the infringer would not be a salable commodity, the complainant is entitled to the whole profits obtained from its use."

THE LEGAL STANDING OF AN UNADJUDICATED PATENT.—A corporation, owner of a patent, brought suit against another corporation for infringement. The defendant denied validity and pleaded prior use and anticipation, but before trial purchased the stock of complainant and took an assignment of the patent. A person who had owned one share of the stock in the complainant corporation, and who was at the time of the institution of the suit employed by it as superintendent, obtained a patent for a similar article after the sale of the stock; and a new corporation was formed to manufacture thereunder, in which he became a stockholder and an investor. The assignee of the early patent commenced suit against him and the new corporation for infringement. On these facts, the Circuit Court of Appeals for the Fourth District decided (113 Fed. Rep. 629) that the patent never having been adjudicated, the former suit secured no ground warranting the granting of a preliminary injunction against the defendant.

USE OF CHRISTIAN NAME.—Holding as a basis for its opinion that the surname Smith does not identify an individual in a New England town, the United States Circuit Court for the District of Connecticut (112 Fed. Rep. 998) refused to restrain Welcome A. Smith from using his name on labels for soap manufactured for him, at the suit of Lever Brothers, Limited, Boston Works, who had expended large amounts of money in advertising another soap designated as "Welcome" soap, the word being registered as a trade-mark. The court, however, held that the use by defendant of the word "Welcome," segregated from the surname, or in larger type or letters than the surname, or so located as to admit the inference that the soap is "Welcome" soap, manufactured by A. Smith, should be restrained.

COMMON-LAW RIGHT IN A TRADE-MARK.—The common law right to the exclusive use of a word, symbol, or device as a trade-mark is not given merely by its adoption as such. The mark must also have been used for such a length of time, and under such circumstances, as to identify the firm in connection with which it is used to the trade. This common-law right was thoroughly discussed in Macmahan Pharmacal Company vs. Denver Chemical Manufacturing Company (113 Fed. Rep. 468).

A pharmacist in New York city for twenty years made and sold a liquid preparation for use by dentists under the name of "Macmahan's Concentrated (or saturated) Tincture, Aconite, with Iodine." After that time he was succeeded by a corporation which continued to make and sell the preparation, adding to the designation on the labels the word "Antiphlogistine." On cards and circulars it was described by the name "Macmahan's Antiphlogistine," but such cards or circulars were not shown to have been distributed to any extent, and the preparation was not advertised in any other manner. In ten years the company made but 362 sales, to 98 different customers, almost exclusively dentists, who purchased for their own use. The article was not known in the market generally, nor even to pharmacists in the city. It was therefore held, that the company did not have an exclusive right to the use of the word "Antiphlogistine," as a trade-mark, and especially against another company which had adopted it, without knowledge of such use of a trade-mark, to designate a plastic preparation, which was adapted to the use of dentists and intended for external application, and which, during a number of years, it had advertised extensively, and in which it had built up an extensive trade.

SACCHARIN DECISION IN ENGLAND.—In an action brought for an injunction to restrain the infringement of five patents, which covered all known methods of making pure saccharin, the plaintiffs were unable to prove which of the patents had been infringed. The evidence showed that the infringing articles complained of consisted of pure saccharin; that pure saccharin could not be produced by the use of the processes described in an expired patent for saccharin upon which the defendant relied; and that one of the patents sued upon must have been infringed.

It was held that an injunction and inquiry as to damages should be granted, but that the injunction should be limited to the period covered by the oldest of the five unexpired patents. The plaintiffs were awarded the costs of both actions; but, although they held a certificate of validity of one of the patents, the Judge, as the only issue in the actions was infringement, certified for party and party costs only.

DOCTRINE OF EQUIVALENTS IN INFRINGEMENTS.—In the matter of Lepper vs. Randall the Circuit Court of Appeals reversed the decision of the lower court, on the ground that a patentee is not to be denied protection commensurate with the scope of his actual and distinctly described invention by wholly excluding him from the benefit of the doctrine of equivalents, even as against one who has made only such changes as are palpably colorable and of such character as to show that they were studied evasions of the particular devices described in the patent. The patent in question was granted to Merritt and Lepper, for a hand reaper. One of the claims covered a reaper and "fastening devices on the back thereof." The claim was held to be infringed by a reaper in all respects identical with the patented article, with the exception that the fastenings are straps and buckles.

PROPOSED EXTENSION OF THE BOWERS DREDGING MACHINE PATENT.—A bill has been presented to the House of Representatives by Mr. Metcalf, the object of which is to extend Alfonso Bowers' patent for a dredging machine. If there is any patent ever issued by the United States that should not be extended, it is this very one. Time and time again Bowers amended his case in the patent office. For years he was a thorn in the side of the Patent Office examiners. When the patent finally did issue with a bewildering number of claims, probably no one knew what it covered except the inventor himself. These claims have been a source of annoyance to the makers and users of dredging machinery ever since they were issued. Justly or unjustly they cover about everything that is valuable in dredging machinery of this particular type. It is trusted that Congress will not permit this bill to pass.

ACCOUNTING FOR DAMAGES IN INFRINGEMENT SUITS.—In the case of the Regina Music Box Company vs. F. G. Otto Sons (114 Fed. Rep. 505) it appeared, on an accounting for damages for the manufacture and sale by defendants of the infringing music boxes, that the patent was the foundation patent for the class of automatic instruments which it described and claimed. The complainant had a monopoly and was able to supply the boxes sold by defendants. "It is to be assumed," said the Court, "that but for the infringement all the instruments sold by defendants would have been purchased from complainant, and this presumption is not overcome by evidence showing that some of them were supplied on orders from customers who dealt exclusively with defendants."

UNFAIR COMPETITION.—Where the attempt is made so closely to imitate a competing article as to confuse and deceive purchasers, the courts will not be nice in limiting the scope of the relief granted because some of the imitations if practised singly and without fraudulent intent might not constitute unfair competition; and, when unfair competition has been found, the courts should not give their approval in advance to any suggested or proposed changes, leaving to the defendant the responsibility of deciding for himself what changes are necessary to avoid further infringement. (112 Fed. Rep. 1000.)

RECENTLY PATENTED INVENTIONS.

Agricultural Improvements.

COMBINED RAKE AND STACKER.—J. H. KINDSVATER, Russell, Kan. This rake and stacker, which is provided for use in connection with all kinds of grain and feed, can be operated by one man and either one or two teams according to the size of the machine used. The construction of the machine is such that the rake may be carried to a gathering, carrying and dumping position, the latter being automatically accomplished when a proper point is reached relative to the stack and while the machine is in motion.

Hardware and Plumbing.

LOCK.—J. L. COULTER, Bovina Center, N. Y. This invention provides a lock attachment for the usual cottage-latch so that the latch cannot be opened without the application of a key. The latch is formed near its pivoted end with two recesses in which the finger of a tumbler is engaged. The tumbler is provided with a forward extension which is adapted to be wedged between the latch and a stop in the casing. The tumbler can be moved out of locking position only by the operation of a key.

FIXTURES FOR WASHSTANDS, BATH-TUBS, OR THE LIKE.—A. P. WINDOLPH, New York, N. Y. This fixture, which is adapted for use on washstands, bathtubs or the like, is designed for controlling the flow of cold or hot water, or a graduated mixture of the same, and also for controlling the waste and overflow. The ordinary overflow openings in the bowl are completely dispensed with, and use is made of a branched waste pipe to dispose of any overflow to prevent flooding of the room.

Engineering Improvements.

IGNITER.—C. A. WILKINSON, Worcester, Mass. This invention relates to an electric spark igniter for internal combustion engines, and it comprises certain novel features of construction, particularly adapted for this office. The igniter operates without the action of any external operating mechanism, and since the contacting parts are normally in contact with each other there is no liability of their becoming clogged or fouled so as to destroy effective contact.

WATER-WHEEL.—S. M. THURMAN, Yuma, Arizona Ter. This water-wheel belongs to that type in which the water flows against and underneath the same, and the power of the wheel in rotating is carried by suitable mechanism to any desired point of utilization. The water-wheel is of relatively small diameter, which may be either partly or wholly submerged, and which when located in running water containing drift wood will readily ride over the same without being damaged thereby or stopping its action.

Machines and Mechanical Devices.

ROAD-OILING MACHINE.—T. F. WHITE, Chino, Cal. This machine is used in making and preserving roads, paths, etc., and is designed to distribute petroleum over the whole surface to be oiled, to gage the amount distributed, and to allow of discharging different quantities of petroleum on different portions of the width of the road according to the requirements.

PUNCHING-MACHINE.—J. HEISSENBERGER, New York, N. Y. This coin-controlled punching-machine is designed to accurately indicate in pounds upon a dial the force of a blow struck. The construction is such that after the blow is delivered the pointer on the dial will remain in position to indicate the record made until it be purposely released.

LATHE FOR TURNING IRREGULAR FORMS.—F. J. LELAND, Knoxville, Tenn. This machine is adapted particularly for fitting tool handles to the tool eyes. The handles must be made at the eye end to certain sizes or gages corresponding to the gage of the openings in the tools. This invention provides an easy mechanical method of accomplishing this result accurately.

MEANS FOR STOPPING LOOMS AT INTERVALS.—G. A. CUFF, Paterson, N. J. In the manufacture of ribbons it is the custom to weave the ribbon in lengths of ten yards; the special object of this invention is to stop the ribbon loom accurately at every ten yards along the length of the ribbon, after which the ribbon may be moved slightly with the warp threads and the weaving then resumed. The result of this operation is that the ribbon will have a small section at each ten yards in which there is no filling, this part serving as a mark for subsequently cutting the ribbon.

WOOD-FLUTING MACHINE.—E. RAWSON, Moscow, Idaho. Mr. Rawson has provided an improved fluting machine, more especially designed for quickly and accurately forming longitudinal flutes on columns, table legs and similar articles. The machine can be readily adapted for other work,—that is a circular saw may be used for cutting wood, and a cutter head may be used for grooving undulating articles, a gage shoe traveling on the surface of the article to insure uniformity in the depth of the cut.

AUTOMATIC WEIGHING-MACHINE.—F. BARTO, Islip, N. Y. This weighing machine, which is used for measuring or weighing grain or other substances, is arranged to permit of minute adjustment of the parts to insure accurate weighing, either for weighing the material successively in equal quantities or in unequal quantities, and for delivering the measured quantities to separate receptacles.

Railway Improvements.

AIR-BRAKE ATTACHMENT.—T. C. MANSON, Lake Charles, La. Mr. Manson has invented an air-brake attachment which acts to cause instant application of the brakes upon the derailment or other disarrangement of the car-trucks. This end is attained by placing a cock in the train air-pipe or in some other analogous part of the brake system containing the air pressure and connecting this cock with the truck. The parts are so adjusted that should the truck become disarranged and thereby endanger the safety of the train the cock will be opened to exhaust the train pipe and the brakes will be applied.

RAIL JOINT.—S. M. WIXCEL, Marcus, Iowa. The invention comprises two peculiarly-shaped clamping sections adapted to be wedged together with the rail section between them and having angle bars bearing under the ball of the rail not only to hold the sections of rail in proper position, but also to securely brace the various parts.

SWITCH-STAND ATTACHMENT.—H. F. ONG, Wendling, Oregon. Mr. Ong has invented a means whereby warning may be instantly given when the hand lever of a switch-stand is unlocked, thus informing track-men and trainmen that the switch is, if not open, in a dangerous position. This end is attained by providing a "target" or signal and connecting this with the hand lever of a switch stand in such a way that the instant the hand lever is released from its socket the target will be thrown to an extent sufficient to give the warning.

GUARD-RAIL FOR STREET-CARS.—W. S. BRADLEY, Willow Grove, Pa. This invention provides a guard for the sides of such conveyances as open trolley cars. The guard may be adjusted, when not in use, beneath the body of the car, or when desired may be turned outwardly and raised to a position above the level of the seat, thus preventing passengers from getting on or off on that side of the car, and thereby securing safety to the passengers from cars passing in the opposite direction.

Vehicles and Their Accessories.

HARNESS.—A. L. HAWKINS, Georgetown, Tex. This harness is constructed of few pieces so disposed that the traces will extend from the front singletree to a point near the saddle or belly-band, the collar of the harness being dispensed with and a shoulder-strap being employed instead, which serves as a support for the forward singletree.

VEHICLE-FASTENING FOR HARNESS.—M. MCNALLY, St. Louis, Mo. This device may be used for holding traces upon singletrees and for holding straps of any kind upon neck-yokes and shafts. The utility of the device, owing to its novel construction, will readily suggest itself to persons skilled in the art to which it relates.

Miscellaneous Inventions.

NON-REFILLABLE BOTTLE.—C. F. MITCHELL, Baltimore, Md. The object of this invention is to provide an improved construction of non-refillable bottle, in the use of which it will be necessary to break off the end of the neck of the bottle before the contents can be poured off.

KINDERGARTEN LOOM.—BEATRICE E. LINDBERG, Faribault, Minn. This invention relates to an educational appliance and provides a hand school-loom for use by school children in industrial work. The loom is arranged to hold the warp properly stretched and spaced apart and permits of conveniently beating in the weft to insure perfect work.

HAT-PIN RETAINER.—E. KRANCHER, Brooklyn, N. Y. This retainer provides means for protecting ladies' hats and auxiliary parts, such as ribbons and ornaments, from the effects of mutilations caused by the use of hat-pins. The device comprises a button having a resilient filling for the purpose of receiving the shaft of a hat-pin.

MOISTENER.—L. S. DUNCAN, New York, N. Y. This device is employed in moistening the adhesive on envelope-flaps and the like. The construction of the moistener is such that the envelopes may be rapidly moistened and the moisture spread evenly and thinly, thus preventing the forcing out of water and gum onto the envelope body when the flap is pressed down.

VENTILATOR.—T. M. CARPENTER and F. L. BAKER, Los Angeles, Cal. The invention relates to ventilators for carrying off the impure gases from water-closets and various devices in sanitary plumbing. It is particularly adapted for use in connection with a flushing apparatus, and comprises a motor driven by the water as it falls into the flush tank, such motor operating an exhaust fan for carrying off the gases from the vicinity.

CROSSING-GATE.—M. C. BARRY, Atlanta, Ga. This gate which is employed for railway crossings is provided with novel and simple releasing and resetting devices arranged along the track and adapted to be operated by a locomotive passing along the track. Should a person be driving a team between the gate and the track when the gate is closed, it may be swung open laterally to permit that person's escape.

ATTACHMENT FOR MOUTH-HARMONICAS.—A. S. ALEXANDER and A. VISCHER, New York, N. Y. The attachment consists of a bell or horn closed at one end, and having in its side an elongated opening for receiving the mouth-harmonica. The harmonica can be readily detached from the bell whenever desired, and when used with the bell the sounds which emanate from the horn are greatly reinforced and correspond in quality to that of a brass instrument.

MERRY-GO-ROUND.—C. LOOFF, JR., Brooklyn, N. Y. The object of the invention is to provide an improved merry-go-round arranged to give the seats a uniform up-and-down motion without requiring much driving power. This result is obtained by employing friction rollers which travel freely in cam grooves and consequently impart an easy rocking motion to the shafts from which the seats are hung.

WINDOW SHADE AND FIXTURE.—J. ECKERT, New York, N. Y. The window shade is made up of a series of strips so hung that each will be provided with a spring-controlled roller and pivotal supports for the hangers of the rollers. The sections may be made to overlap and substantially close the space within the window frame, or they may be so turned as to regulate the amount of light to be admitted into the room.

BOTTLE-HOLDER.—E. C. LUDIN, New York, N. Y. Mr. Ludin has provided a simple device comprising a base and a series of U-shaped arms between which a bottle may be securely supported in an upright position. A novel method has been employed for securing these arms to the standard.

CHATELAINE-HOOK.—L. B. PRAHAR, Brooklyn, N. Y. Three patents have been granted to Mr. Prahar for improvements in chatelaine-hooks. The chatelaine-hooks are provided with a locking tongue which will automatically adjust and lock itself to the support on which it is placed. Simple and effective means are employed for releasing the tongue from the support whenever desired. The parts are so constructed that they are not liable to be disarranged and may quickly be brought into locking engagement, remaining in such engagement until the releasing means is purposedly manipulated.

The second invention provides, further, a spring-controlled tongue for holding the hooks safely upon a belt or band, which tongue is operated at the front portion of the hook through the medium of an upwardly-extending lever handle.

In the third invention Mr. Prahar has provided a chatelaine-hook constructed of three pieces, and without springs, which is positive in its locking and unlocking action.

SASH-HOLDER.—W. M. REELY, Spokane, Wash. The invention belongs to that class of sash-holders in which a shoe is pressed by a spring against the sash or window jamb, to hold the sash at any desired point. This improved sash-holder may be readily applied and repaired, and removed when necessary. The tension of the spring may also be regulated to compensate for wear

ANKLE-SUPPORT—F. H. READ, Providence, R. I. This ankle-support is more especially designed for the use of skaters and other persons to sustain weak ankles. The support comprises an instep strap and an ankle strap fixed at right angles thereto, whereby the ankle may be properly supported.

HEARSE.—D. JOHNSTON, Watseka, Ill. This invention relates particularly to improvements in devices for clamping a casket in a hearse. The object is to provide clamping devices with means whereby they may be quickly and simultaneously adjusted to different sizes of caskets, and when adjusted will prevent movement of the casket on the floor of the hearse.

VENTILATOR AND MIRROR-PROTECTOR.—W. C. MCBRIDE, Hillsboro, Texas. The object of this invention is to so arrange pendant streamers and a rotatable fan near a mirror that the means for actuating the fan will serve to agitate the streamers for the chasing of flies from the mirror, and also ventilate and cool a room by the current of wind which the fan produces.

STRING-FASTENING DEVICE.—E. FLOWERS, Harrisburg, Pa. This device is employed for facliating the fastening of strings around packages. It comprises a clasp of peculiar form, which is adapted to be attached to one end of a length of cord, so that the cord may be passed around various sides of a package of any sort and engage with the clasp at one or more points in order to hold the cord securely without necessitating knotting it.

ORE-TESTING TABLET.—H. E. WAY, Custer, S. D. This invention provides a means by which miners may determine without special knowledge or skill and without the aid of delicate and expensive apparatus the presence in ores of metals having commercial value. The tablet comprises a fuel and a decomposible compound containing oxygen for burning said fuel, whereby a reducing heat is obtained and nascent reducing agents are furnished.

COMBINED CRIB AND TABLE.—H. G. DORAN, Brooklyn, N. Y. Mr. Doran has invented an article of furniture which may be used as a crib or as a table, and be quickly changed from one to the other. The construction is such that the body section may be locked automatically when brought into position to be used as a table, and the mattress may be locked in position in the body, the surface of the body presented as a table being unbroken from end to end.

ANTIRATTLER FOR AWNING-FIXTURES.—J. SULLIVAN, New York, N. Y. By using Mr. Sullivan's device, no matter how violently the awning frame may be raised and lowered, there will be no rattling, as each engaging point is protected by a pliable washer, causing the movement of the awning frame to be perfectly noiseless. The device is not only simple and economic, but it may be easily applied and when damaged or worn may be conveniently replaced by a fresh one.

AUTOMATIC THRESHOLD.—C. R. SOWDEN, Basin, Montana. In this invention Mr. Sowden provides a weather-strip so constructed that when the door is closed the weather-strip will be automatically carried upward into engagement with the bottom face of the door, thus excluding the weather, dust, etc., from the room. When the door is open, the weather-strip will be about flush with the threshold strip or at a point below its upper face.

LACING DEVICE.—EMILE SAVOYE, 35 Rue du Caire, Paris, France. The purpose of this invention is to overcome abrasion of the lacing cord used in connection with lacing eyelets or analogous devices by manufacturing eyelets of rounded wire, the same being so bent as to form a series of coils. Each eyelet thus presents rounded edges and guiding surfaces of suitable length, so that it does not chafe and wear out the lacing cord, but permits it to slide easily and freely through the opening.

CURTAIN-POLE AND SHADE-ROLLER BRACKET.—G. L. LYONS, Bradford, Pa. This device, which is in the form of a double bracket, is adapted to support a shade-roller and also to support a curtain-pole above the shade-roller. The bearings of the curtain-pole being horizontally adjustable to or from the frame to which the device is applied. The adjustable bearings are so constructed that set screws or other forms of fastening devices are entirely dispensed with.

FILLING-INDICATOR.—L. F. DOELLINGER, Davenport, Ia. This indicator is adapted for use on lamps or other non-transparent receptacles to indicate when the body has been filled to proper height with the liquid. The indicator is operated by a flont to close an opening in the indicator-cap when a proper level of liquid has been attained.

ICE-RUNWAY.—F. H. and C. H. EICHHORN and F. P. DERNELL, Athens, N. Y. The invention relates to improvements in runways or chutes for transferring cakes of ice from an elevator or the like to an ice-house or to a vessel. The construction is such that the ice cakes may be directed at will to different compartments of an ice-house or different parts of a transporting barge or the like.

COLLAPSIBLE CARTON.—C. H. RUSSELL, Manistee, Mich. The carton consists of two blanks suitably scored, one of which forms the top, bottom and rear walls thereof, the other blank forming the front and end walls and laps thereto, and means are provided for securing the laps to the rear walls. The invention affords an efficient article to receive filers and cell cases such as are usually used for carrying eggs or other articles. When desired the carton may be collapsed or folded for return shipment.

GLOVE.—MINNIE E. ROLLASON, Brooklyn, N. Y. The invention relates more particularly to means for securing long gloves upon the arm. The glove is placed upon the hand and arm in the usual manner, and then flexible members are spirally wound around the arm in opposite directions and threaded through apertures therein so as to cross each other at a number of points. The loose ends are then tied together in any desired manner.

IRONING-BOARD.—G. KAHLER, Wymore, Neb. This ironing-board is provided with novel details of construction which render it foldable in parts and afford a supporting leg held in open adjustment by spring pressure and the coaction of a keeper block adapted for sliding adjustment. The construction is simple, substantial and inexpensive.

MOISTURE-PROOF CIGAR-BOX.—A. MORTEN, New York, N. Y. The invention relates to boxes for cigars, the object being to preserve the same so that they will always be fresh and retain their flavor, together with the proper amount of moisture. Mr. Morten has found that the best results are attained with an inner lining of cedar wood, an outer lining of oak, and an intermediate layer of felt. The bottom of the box should be provided with perforations, the idea being not to make the box air-tight nor to allow too free ingress and egress of the air, but to admit only a certain amount and to exclude all moisture except that already in the cigars.

WINDOW-SCREEN.—C. B. WARNER, Avon, Ill. The invention provides novel details of construction for window screens having the sheet metal frames, which adapt the screen frame for adjustment to fit it for use in windows of different widths. The screen is further provided with a hand hole opening and a closure therefor of novel construction.

PAPER-FILE.—E. W. SANDSTEDT, Hankow, China. Mr. Sandstedt has invented an improved device for holding files of newspapers. The device, which is light, yet strong, is so

arranged as to have no projecting parts to damage the papers, scratch articles of furniture, or catch in the clothing to the inconvenience of the reader. The paper file is adapted to be locked and opened with a key.

ANIMAL-POKE.—S. A. RITCHIE, North Middletown, Ky. Mr. Ritchie has invented a simple poke for animals, particularly horses. The device is fastened to the animal by yoke members around the animal's neck, the lock of this yoke being so arranged that it cannot be accidentally released by the animal rubbing it against a fence or tree. The yoke may be readily unlocked whenever it is desired to remove the device.

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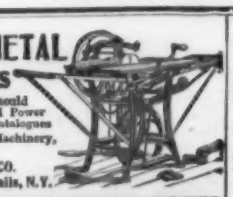

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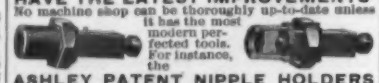

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NEW BOOKS ETC.

FAMILIAR BUTTERFLIES AND MOTHS. By W. F. Kirby, F.L.S., F.E.S. London and New York: Cassell & Co., Ltd. 1901. 8vo. Pp. 144, 18 plates.

The author has endeavored to give a popular account of some of the more interesting of the British butterflies and moths, and has added a small selection of European species as well. The book is fairly attractive, and undoubtedly will prove very interesting to naturalists and collectors.

DRAGONS OF THE AIR. By H. G. Seeley, F.R.S. New York: D. Appleton & Co. 1901. 16mo. Pp. 238. Price, $1.40.

The present volume is an account of extinct flying animals, and is accompanied by a most interesting series of illustrations. The subject is most fascinating, and the author has made a valuable contribution to geological literature.

THE MANUFACTURE OF IRON AND THE SULPHATES OF OTHER SALTS OF ALUMINA AND IRON. By Lucien Geschwind. London: Scott, Greenwood & Co. New York: D. Van Nostrand Company. 1901. 8vo. Pp. 387. Price, $5.

The present volume treats of the uses of alumina sulphates and other salts of alumina and iron as mordants in dyeing and calico printing, and their other applications in the arts, manufactures, sanitary engineering, agriculture and horticulture. A vast amount of technical information totally unobtainable elsewhere is here brought into concrete and usable form. The author has performed a most difficult task, and the result is most admirable.

DELSARTE SYSTEM OF EXPRESSION. By Genevieve Stebbins. New York: Edgar S. Werner Publishing and Supply Company. 1902. 16mo. Pp. 507. Price $2.

One of the aims of the Delsarte system is so to train the body that those muscles only that should operate to perform any given act are used. The lack of physical culture, lack of physical control, is shown by muscles that should not move in any given act, thereby interfering with those muscles whose rightful function it is to perform that given act. There can be no grace, no rightful expression, until this interference is stopped. Delsarte taught relaxation as well as tension, repose as well as action. It is this system that the author has made the subject of a useful book.

THE ELEMENTS OF PHYSICAL CHEMISTRY. By Harry C. Jones. New York: The Macmillan Company. 1902. 8vo. Pp. 565. Price $4.

It is now generally known that within the last fifteen years a new branch of science has come into existence. This branch, occupying a position between physics and chemistry, is known as physical chemistry. It has been the aim of the author to deal with the whole subject of physical chemistry in an elementary manner. The book is one that cannot fail to prove of value to all who are in any way interested in chemical science.

FUMIGATION METHODS. By Willis G. Johnson, New York: Orange Judd Company. 1902. 8vo. Pp. xvi, 309.

It is stated that this work describes the best methods of fumigation. These best methods are claimed by the author to be fumigation with hydrocyanic acid gas and carbon bisulphide. The topics are discussed with fullness in a clear style. The illustrations in the book might be clearer.

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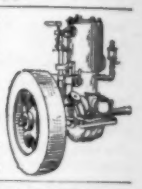

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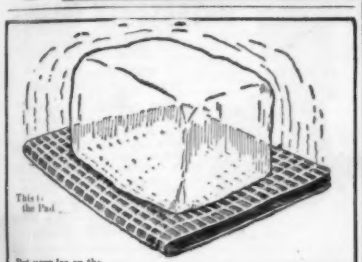

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JANUARY--JUNE, 1902.
278 Illustrations. 120 Pages. 6 Tint-Blocks.

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TALKS WITH ARCHITECTS. . .
This interesting series of conversations with eminent architects by Mr. Barr Ferree comprises important talks with Mr. Thomas Hastings on "Some Suggestions for New York"; Mr. William J. Fryer on "The New Tenement House Law of New York"; Mr. Charles A. Rich on "The Development of the Small College"; Mr. John Galen Howard on "The Beaux-Arts Architects"; Mr. J. Monroe Hewlett on "The Architect and the Municipality"; and Mr. George L. Morse on "The Durability of Steel Construction."

EDITORIAL ARTICLES. . .
Suggestive discussions on timely subjects for the home-builder: "Municipal Art"; "Roads and Houses"; "Washington the Magnificent"; "The House and the Terrace"; "The Art of Home-Building"; "Kitchen Ends and Back Yards."

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HINTS TO CORRESPONDENTS.

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References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled

(8643) H. S. L. asks: 1. About an ink which can be used with a drawing pen upon zinc and which when dry or burned in will be acid-proof. A. Ink for Zinc Labels: Take 1 drachm verdigris, 1 drachm sal-ammoniac powder and ½ drachm lamp black, and mix them with 10 drachms water. This will form an indelible ink for writing on zinc. 2. A means for an amateur to impart a polish (high) to chestnut boards. A. Fill the wood with any good filler, let it dry, then apply a good varnish, two or three successive coats. Rub it down with powdered pumice stone, then with rotten stone, and finally finish with whiting, all in water. Apply with a felt or flannel rubber.

(8644) A. P. F. asks: 1. What would be the effect on a corrugated iron roof if lightning should strike it? Is it dangerous to the inmates of a house to use such material for a roof? A. If your corrugated iron roof is connected with water or moist earth at several points by heavy telegraph wire or small iron rods, it will serve very well as a lightning rod to protect the premises from being struck. If not connected to the earth, we think it is a source of peril. 2. Of what cheap material can we make a belt about 8 feet in length for light service, width 1½ inches? 2. Belts are either made of leather or webbing. They must be inelastic, so as not to stretch in service. We do not know of any cheap substitute for regular belting.

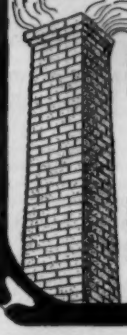
(8645) A. B. D. asks: In applying gold leaf to sign work, what would be the sizing used? A. In wood signs use gold size. For glass signs use a thin solution of gelatin.

(8646) H. S. asks for a remedy for dandruff, also a preparation for cleaning soiled spots from clothing. A. The treatment of the hair consists in daily washing of the head or other parts affected with warm water, 1 pint; glycerine, ½ ounce. This should be thoroughly rubbed over the skin; the dilute citrine ointment (sold by all chemists) may be used at night. A good preventive, and in mild cases, a curative wash is water, 1 pint; borax, 1 ounce. As a preventive, it should be used once weekly; as a curative, twice daily. Use true benzol for taking grease from clothing. Keep it away from a light or fire.

(8647) E. A. B. writes: I would be pleased to know by what chemicals or solutions blue prints may be changed from their original color (blue) to colors heretofore discovered? A. Blue Prints, to Change to Brown: Borax, 2½ ounces; hot water, 38 ounces. When cool add sulphuric acid in small quantities until blue litmus paper turns slightly red, then add a few drops of ammonia until the alkaline reaction appears and red litmus paper turns blue. Then add to the solution 154 grains of red crude gum catechu. Allow it to dissolve with occasional stirring. The solution will keep indefinitely. After the print has been washed out in the usual way, immerse it in the above bath a minute or so longer than it appears when the desired tone is reached. An olive brown or a blackish brown is the result. To Make Blue Prints Green: Make four solutions as follows: Solution A. Water 8 ounces and a crystal of nitrate of silver as big as a pea. Solution B. Hydrochloric acid 1 ounce and water 8 ounces. Solution C. Pour a solution of iodide of potassium (iodide of potassium 1 ounce and water 8 ounces) into a saturated solution of bichloride of mercury until the red precipitate is just dissolved, and then add four times as much water as the resulting solution. Solution D. Water 16 ounces and iodide of potassium 1 drachm. Then take the blue print and bleach it with solution A, when the image will become pale slate color or sometimes a pale yellow. Then wash thoroughly and immerse the print in solution B, when the image will again become blue. Then, without washing, immerse the print in solution C, when the image will become green but the "whites" will be of a yellow tint. Then put the print in solution B again, without washing. Then wash and pour solution D over the print to purify the whites and to give the green image a bluer tint; but do not leave print in this solution too long, as it has a tendency to make the print blue again.

(Continued on page 80)

If You Wear a Watch In a Factory or Shop



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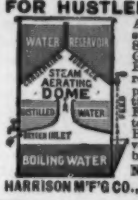

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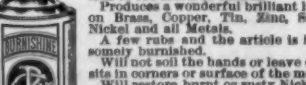

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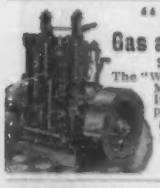

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(8648) F. W. H. asks: I wish to make an electro-magnet with the greatest lifting power possible to be furnished current from a 10-volt 75-ampere plating dynamo. What size and how much wire should I use, and what size and length of core? Do you think such a magnet could be so insulated as to be used under solution for raising iron articles from bottom of tanks? A. A magnet can be made which will lift any weight from nothing up to several tons with the current named above, provided the armature were in contact with the poles of the magnet; but to draw articles from the bottom of a tank through an open space, that is, a space not filled with iron, is a different matter. It would require an enormous power to lift a very small weight from the bottom of even a shallow tank. The method proposed is not economical or practical. Better fish them up in the old-fashioned way.

(8649) O. W. W. writes: On Christmas day in 1900 the sun was shining very warmly in the south door. On a table near the door we had a fish globe. As we were eating dinner, smoke was seen rising from the table on which the fish globe was placed. A close examination showed that the table cloth had be set on fire by the sun's rays being magnified by the fish globe. A. A fish globe is a frequent source of fires. The action is the same as that of a lens or burning glass. The rays of the sun are brought to a focus, and their heat is sufficient to ignite combustible material. When a fish globe is hung in a window so that the sun's rays strike it, a curtain behind the globe is easily set on fire, and people wonder how the fire started. There is no mystery about it.

(8650) G. M. T. asks: In still air will two spheres of the same size, one of aluminium and one of lead, fall from a given height in the same time? A. Since the velocity of a freely falling body is dependent only upon the mass of the earth, it follows that all bodies will fall in a vacuum with the same velocity, viz., 32.16 feet at the end of the first second of fall; and since the air will resist two spheres of the same size equally, because they displace the same weight of air, it follows that the two spheres of the same size will fall with the same velocity under the action of gravity in the air, and therefore will fall through a given height in the same time.

(8651) C. C. N. asks: Where can I find instructions to make appliances and use "Electro Culture" for gardening? A. We regret to say that we do not know where appliances for "electro-culture" for gardening can be found. We have never heard of any such apparatus on the market. We have read of experiments upon plants, but doubt if these have led as yet to practical results, so that apparatus has been devised for such use.

(8652) J. H. R. writes: I desire to purchase books which would thoroughly inform me upon the following case: A building is lighted with 23 incandescent lamps arranged in parallel. The current is supplied through a transformer which reduces the voltage from 2200 to 110. A man takes hold of the socket of one of the lamps and is killed. I want to be able to inform myself on the following questions: First, the precautions necessary in handling high-tension currents and where the danger points are. 2. The liability of transformers to leak, break down, etc., thus delivering the full voltage to the wire leading from it, etc. 3. What is the cause of death? Is is wattage, voltage, amperage, and what is the usual amount necessary to kill a person? Would the current coming from a tansformer cutting it down to 110 volts and necessary to supply 24 incandescent lamps be sufficient? Would that supplied to one of these lamps be sufficient? A. Thompson's "Elementary Lessons in Electricity," price $1.40 by mail, contains as much as is given in any one book upon the topics concerning which you inquire. Rubber gloves and tools with insulated handles are necessary for handling wires carrying current above 110 volts. This pressure may have inflicted severe injury or even death in extreme cases, but we do not recollect any instance of death from it. In the case cited it would seem as if there must have been a connection with the primary of the transformer. Death is caused either by the shock of the current or by the disintegration of the vital tissues from its continued action on them. The amperes are the agent of electrolysis; the volts determine the amount of amperes which can flow through a circuit in proportion to its resistance, as expressed in ohms. The resistance of the human body is a variable quantity, from a few hundred to perhaps five thousand ohms. What current a man can get is not a question of the supply of one lamp or any number of lamps. It is a matter of the voltage of the current and the resistance of the body.

(8653) J. H. L., Jr., asks: 1. How many sal-ammoniac batteries should one pound of sal-ammoniac charge, divided equally among them? A. That depends upon the size of the cells of the battery. The sal-ammoniac solution is saturated. In the cell with a porous cup about a quarter of a pound of the salt is required; in the forms with larger carbons, or the prism, in which more liquid is used, a larger quantity would be needed. 2. The cause of crystals forming on the carbon element of a

(Continued on page 81)

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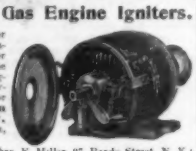

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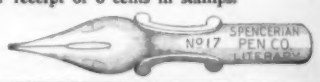

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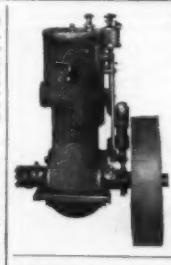

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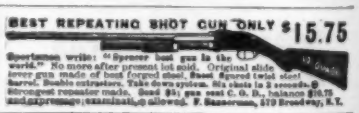

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sal-ammoniac battery? A. The action of a Leclanche cell is always accompanied by the formation of a double salt of zinc and ammonium, which crystallizes upon the elements of the bottom and sides of the dish. 3. If the primary coil of the Hopkins induction coil in SUPPLEMENT No. 160 could not be carried to a small magnet that would operate a vibrator, say several inches away from the bundle of wires forming the core of the coil? A. Separate coil may be used for the vibrator in any induction coil. The current used to run this coil will be in addition to that needed for the main coil. When the vibrator is attached to the main coil, the magnetism of the core acts upon the vibrator without requiring any additional current.

(8654) W. A. P. asks: 1. How many 16 candle power 110-volt lamps are required to cut a 110-volt circuit down to about 5 volts and two amperes? It is to be used to light a very small "pea" incandescent lamp. Is there any better substance to accomplish the decrease? Lamps I prefer. A. Connect four 16 candle power lamps in parallel, and complete the circuit with the pea lamp. The four lamps will give the two amperes, and the combined resistance in parallel will very nearly adjust the drop in potential. 2. I should like to know the formula for resistance carbon. I wish to make rods of ¼ inch diameter, from 6 to 12 inches long. A. For ten cents we can send you a paper giving the details for making carbons.

(8655) L. A. P. asks: 1. I have a small dynamo used for plating. Can I use it for a sparker on my gasoline engine? I have taken hold of the wires when running and have not felt any perceptible current. Should I feel any? A. You can find whether your plating dynamo will answer for sparking a gas engine by breaking the circuit suddenly when it is running at full speed. You cannot tell by taking hold of the wires. The voltage used in plating is not sufficient to give a shock. 2. Would it make any difference if I had a coil connected with it? A. The dynamo would probably run an induction coil. 3. If so, will you please instruct me how to make one. A. A coil giving a spark of a half-inch will ignite the charge in a gas engine. Instructions for making a coil may be had in Norrie's "Induction Coils," price $1 by mail. 4. Which are the best for batteries for motors? A. Four to eight dry cells are commonly used for sparking a gas engine, though any form of sal-ammoniac cell will do the work well.

(8656) D. H. asks for a reliable recipe for preserving eggs. A. Lime, 1 bushel (slaked with water); common salt, 2 or 3 pounds; cream of tartar; ½ pound; water q. s. to form a mixture strong enough to float an egg. Used to preserve eggs, which it is said it will do for two years, by simply keeping them in it.

(8657) J. K. L. asks: 1. How the plates are obtained which are used in printing pictures in papers? A. There are many ways of making the plates from which pictures are printed in papers, both electrical and photographic. If you wish to learn any particular process, we could refer you to the sources of information upon that process. 2. Are there any non-metallic substances, such as carbon, selenium, etc., which can be electroplated? A. Any substance not a conductor can be electroplated by coating it with graphite, which is a conductor, before putting it into the plating bath. 3. If two bodies were revolved at the same speed or rate, and one of them was larger than the other, in which would the centrifugal force be the greatest? A. The centrifugal force varies directly as the weight of the rotating body, and as the square of the velocity of its motion. It also varies inversely as the radius of its orbit. 4. At about how many revolutions per second do you think a shaft of iron would fly to pieces? A. There is no definite answer to this question. It is entirely indefinite. 5. Would a bar of iron 4 inches long be attracted to a pole of a bar magnet with as much force as if it were 8 inches long? A. The length of a bar of soft iron has nothing to do with the attraction of a magnet for it. The force of the magnetism is in the magnet, and not in the bar of iron.

(8658) N. S. writes: In your issue of June 21 is an interesting communication relative to the Sault Ste. Marie Canal. Will you please reply to several questions relative to this subject through your Notes and Queries column, as doubtless others are interested in everything that relates to canals? What is the origin of the words Sault Ste. Marie? Then we read, in your article, as follows: "Ground was broken on the canal June 4, 1853, by one Charles T. Harry, under whose supervision was continued the original Soo canal." Then in the last paragraph we read: "The Soo Canal has more than four times the traffic of the Suez Canal. Vessels passing through the Soo canal average one for every 15 minutes during the 24 hours." The query is, Why the Soo Canal? Is that word synonymous with the Sault Ste. Marie Canal? A. Sault Ste. Marie is archaic French for the "Falls of St. Mary." "Sault" is pronounced in modern French "So," and "Soo" is probably a corruption of "So." The canal is popularly referred to as the "Soo" Canal.

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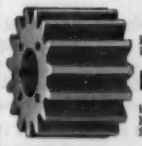

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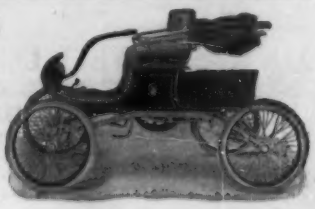

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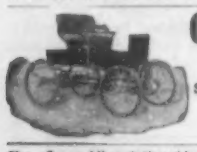

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